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Environmental Impact Report
Volume 3 Appendices

San Francisco Public Utilities Commission

CALAVERAS DAM
REPLACEMENT PROJECT



San Francisco Planning Department File No. 2005.0161E
State Clearinghouse No. 2005102102

Public Draft EIR Publication Date: October 6, 2009

Draft EIR Public Hearing Date:

November 10, 2009 in East Bay

November 12, 2009 in San Francisco

Draft EIR Public Comment Period: October 6, 2009 through November 20, 2009

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CALAVERAS DAM REPLACEMENT PROJECT ENVIRONMENTAL IMPACT REPORT

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Appendix A

Notice of Preparation



PLANNING DEPARTMENT

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October 24, 2005

To Responsible Agencies, Trustee Agencies, and Interested Parties:

RE: CASE NO. 2005.0161E – SFPUC CALAVERAS DAM REPLACEMENT PROJECT NOTICE OF PREPARATION OF AN ENVIRONMENTAL IMPACT REPORT AND NOTICE OF PUBLIC SCOPING MEETINGS

A Notice of Preparation (NOP) of an environmental impact report (EIR) pursuant to the California Environmental Quality Act (CEQA) and a Notice of Public Scoping Meetings for the above-referenced project, described below, has been issued by the San Francisco Planning Department. The NOP and Notice of Public Scoping Meetings is either attached or is available upon request from Diana Sokolove, whom you may reach at (415) 558-5971; diana.sokolove@sfgov.org; or at 30 Van Ness Avenue, Suite 4150, San Francisco, CA 94103. The combined NOP/Notice of Public Scoping Meetings will also be available online by October 24, 2005 at http://www.sfgov.org/site/planning_index.asp and www.sfwater.org (click on Projects and Plans, then Calaveras Dam Replacement).

Project Description: Calaveras Reservoir, located on the boundary of Alameda and Santa Clara Counties, approximately 10 miles southeast of Fremont, California, is the largest Bay Area reservoir in the San Francisco Public Utility Commission's regional water system. Calaveras Dam is located at the northern end of the reservoir, approximately one mile upstream from the confluence of Calaveras and Alameda Creeks. Because the dam is located near a seismically active fault zone and was determined to be seismically vulnerable, the California Department of Water Resources, Division of Safety of Dams (DSOD) has limited since 2001 the amount of water that can be stored in the reservoir to approximately 40 percent of its former full storage capacity (full storage capacity is 96,850 acre-feet of water) until the safety deficiencies are corrected. The Calaveras Dam Replacement Project, as proposed by the SFPUC, includes replacement of the existing dam with one of equivalent height, restored reservoir storage to its full design level, improved seismic design, and operation of Calaveras Reservoir to release up to 6,300 acre-feet per year of water for the enhancement of fisheries and the other natural resources of Calaveras and Alameda Creeks.

The new dam would be constructed at the downstream edge of the existing dam, and the existing dam would be used as a cofferdam (a structure to keep water away from a construction site) during construction of the replacement dam. The cofferdam would allow the reservoir to remain in operation up to the DSOD-restricted level during construction. For seismic safety purposes and improved operations and maintenance, the replacement dam would include a new intake tower, as well as a new outlet valve for water releases necessary for environmental purposes.

The San Francisco Planning Department, Major Environmental Analysis (MEA) Division, is preparing an EIR for consideration by decision-makers prior to a final decision by the SFPUC regarding whether to approve and implement the project. The purpose of the EIR is to provide information about potentially significant environmental effects of the proposed project, to identify possible ways to minimize those potentially significant effects, and to describe and evaluate feasible alternatives to the proposed project. Preparation of an NOP or EIR does not indicate a decision by the City to approve or to disapprove the

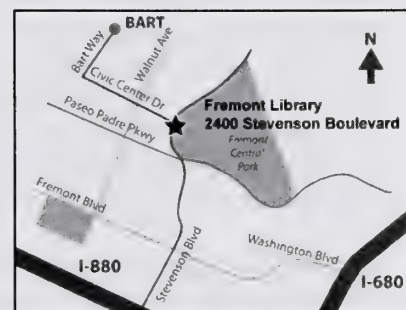
proposed project. However, prior to making any such decision, the decision makers must review and consider the information contained in the EIR.

The San Francisco Planning Department will hold two **PUBLIC SCOPING MEETINGS** at the places, dates, and times listed below. The purpose of these meetings is to receive oral comments to assist the San Francisco Planning Department in reviewing the scope and content of the project's environmental impact analysis and information to be contained in the EIR. Written comments will also be accepted at these meetings and until the close of business on November 30, 2005. Written comments should be sent to the San Francisco Planning Department, Attn: Paul Maltzer, Environmental Review Officer, Calaveras EIR, 30 Van Ness Avenue, Suite 4150, San Francisco, CA 94103, or provided via email to diana.sokolove@sfgov.org. MEA staff will transmit copies of all documents received during the public comment period to the U.S. Army Corps of Engineers (Corps) as the Corps may evaluate the effects of the proposed project under the National Environmental Policy Act (NEPA).

Scoping Meetings

Fremont

Monday, November 14, 2005, 6:30 p.m. - 8:30 p.m.
Fremont Main Library
2400 Stevenson Boulevard
Fremont, CA
(near Fremont BART station)



San Francisco

Tuesday, November 15, 2005, 6:30 p.m. - 8:30 p.m.
San Francisco State University
425 Market Street, Room 301
San Francisco, CA
(near Embarcadero BART station)



If you work for an agency that is a Responsible or Trustee Agency, we need to know the views of your agency as to the scope and content of the environmental information that is relevant to your agency's statutory responsibilities in connection with the proposed project. Your agency may need to use the EIR when considering a permit or other approval for this project. We will also need the name of the contact person for your agency. If you have questions concerning environmental review of the proposed project under CEQA, please contact Diana Sokolove at (415) 558-5971; if you have questions about NEPA review, please contact Robert Smith at (415) 977-8450.

**NOTICE OF PREPARATION OF AN ENVIRONMENTAL IMPACT REPORT AND
NOTICE OF PUBLIC SCOPING MEETINGS**

Date of this Notice: October 24, 2005

Lead Agency: San Francisco Planning Department
30 Van Ness Avenue, Suite 4150
San Francisco, CA 94103

Agency Contact Person: Diana Sokolove **Email:** diana.sokolove@sfgov.org
Telephone: (415) 558-5971

Project Title: Calaveras Dam Replacement Project

Project Sponsor: San Francisco Public Utilities Commission

Project Contact Person: Betsy Lauppe Rhodes **Email:** BLauppe@sfgwater.org
Telephone: (415) 554-3240

Project Address: Calaveras Dam and Reservoir

Assessor's Block and Lot: Various

County: Alameda and Santa Clara Counties

Project Description: Calaveras Reservoir, located on the boundary of Alameda and Santa Clara Counties, approximately 10 miles southeast of Fremont, California, is the largest Bay Area reservoir in the San Francisco Public Utility Commission's regional water system. Calaveras Dam is located at the northern end of the reservoir, approximately one mile upstream from the confluence of Calaveras and Alameda Creeks. Because the dam is located near a seismically active fault zone and was determined to be seismically vulnerable, the California Department of Water Resources, Division of Safety of Dams (DSOD) has limited since 2001 the amount of water that can be stored in the reservoir to approximately 40 percent of its former full storage capacity (full storage capacity is 96,850 acre-feet of water) until the safety deficiencies are corrected. The Calaveras Dam Replacement Project, as proposed by the SFPUC, includes replacement of the existing dam with one of equivalent height, restored reservoir storage to its full design level, improved seismic design, and operation of Calaveras Reservoir to release up to 6,300 acre-feet per year of water for the enhancement of the fisheries and other natural resources of the Calaveras and Alameda Creeks.

The new dam would be constructed at the downstream edge of the existing dam, and the existing dam would be used as a cofferdam (a structure to keep water away from a construction site) during construction of the replacement dam. The cofferdam would allow the reservoir to remain in operation up to the DSOD-restricted level during construction. For seismic safety purposes and improved operations and maintenance, the replacement dam would include a new intake tower, as well as a new outlet valve for water releases necessary for environmental purposes.

Please see the attached for more information about the proposed project, the scope of the EIR, and the anticipated environmental issues.

THIS PROJECT MAY HAVE A SIGNIFICANT EFFECT ON THE ENVIRONMENT; AN ENVIRONMENTAL IMPACT REPORT IS REQUIRED. This determination is based on the criteria of the Guidelines of the State Secretary for Resources, Section 15064 (Determining Significant Effect), and 15065 (Mandatory Findings of significance).

PUBLIC SCOPING MEETINGS will be held pursuant to the State of California Public Resources Code Section 21083.9 and California Environmental Quality Act Guidelines Section 15206 to receive oral comments concerning the scope of the EIR. Two meetings will be held at different locations: November 14, 2005 in Fremont and November 15, 2005 in San Francisco. Please see the attached for more information.

Written comments on the scope of the EIR will be accepted until the close of business on November 30, 2005. Written comments should be sent to the San Francisco Planning Department, Attn: Paul Maltzer, 30 Van Ness Avenue, Suite 4150, San Francisco, CA 94103 or sent by email to diana.sokolove@sfgov.org.

Documents relating to the proposed project are available for review, by appointment, at the San Francisco Planning Department's Major Environmental Analysis office, 30 Van Ness Avenue, Suite 4150. Please call Diana Sokolove at 415-558-5971 to schedule an appointment.

November 24, 2005
Date

D. Sokolove for Paul Maltzer
Paul E. Maltzer, Environmental Review Officer

中文資料請電：(415) 558-6282

Para sa impormasyon sa Tagalog turnawag sa: (415) 558-6251

Para informacion en Espanol llamar al: (415) 558-6307

SFPUC CALAVERAS DAM REPLACEMENT PROJECT CASE NO. 2005.0161E

1.0 OVERVIEW

1.1 San Francisco Water System and Calaveras Dam

The City and County of San Francisco, through the San Francisco Public Utilities Commission (SFPUC), owns and operates a regional water system that extends from the Sierra Nevada Mountains to the San Francisco Bay Area, as shown in Figure 1. The regional water system serves 2.4 million people in San Francisco, San Mateo, Santa Clara, Alameda and Tuolumne Counties. The basic network of major facilities in the regional system was built from the late 1880s through the 1930s. Expansion and improvements of the major facilities continued through the 1970s. The Calaveras Dam and Reservoir, located in the East Bay Hills in Alameda and Santa Clara Counties, is part of the San Francisco water system.

Calaveras Reservoir receives runoff from the Calaveras Creek and Arroyo Hondo watersheds (a drainage area of approximately 100 square miles). During the wet season, water from Alameda Creek is diverted into Calaveras Reservoir through the Alameda Creek Diversion Dam and tunnel (see Figure 2). Water from Calaveras Reservoir flows through the Calaveras Pipeline to the Sunol Valley Water Treatment Plant (SVWTP) where it is treated for distribution.

Although the population within the SFPUC service area has steadily grown, ongoing repairs, maintenance, and upgrades have not kept pace with the overall system needs to meet increasing water demand from customers. Aging facilities within the system, some of which made use of now-outdated construction methods and materials, are currently in need of major repair, rehabilitation, upgrade, and or replacement. In 2001, the California Department of Water Resources, Division of Safety of Dams (DSOD) imposed operating restrictions on Calaveras Dam due to seismic concerns. Until the dam safety deficiencies are corrected, the local storage capacity is reduced and normal system operation is impaired.

The SFPUC developed a regional Water System Improvement Program (WSIP) in February 2005 (see www.sfwater.org). The basic goals of the WSIP are to increase the reliability of the system with respect to water quality, seismic response, water delivery, and water supply to meet water purchase requests in the service area through the year 2030.

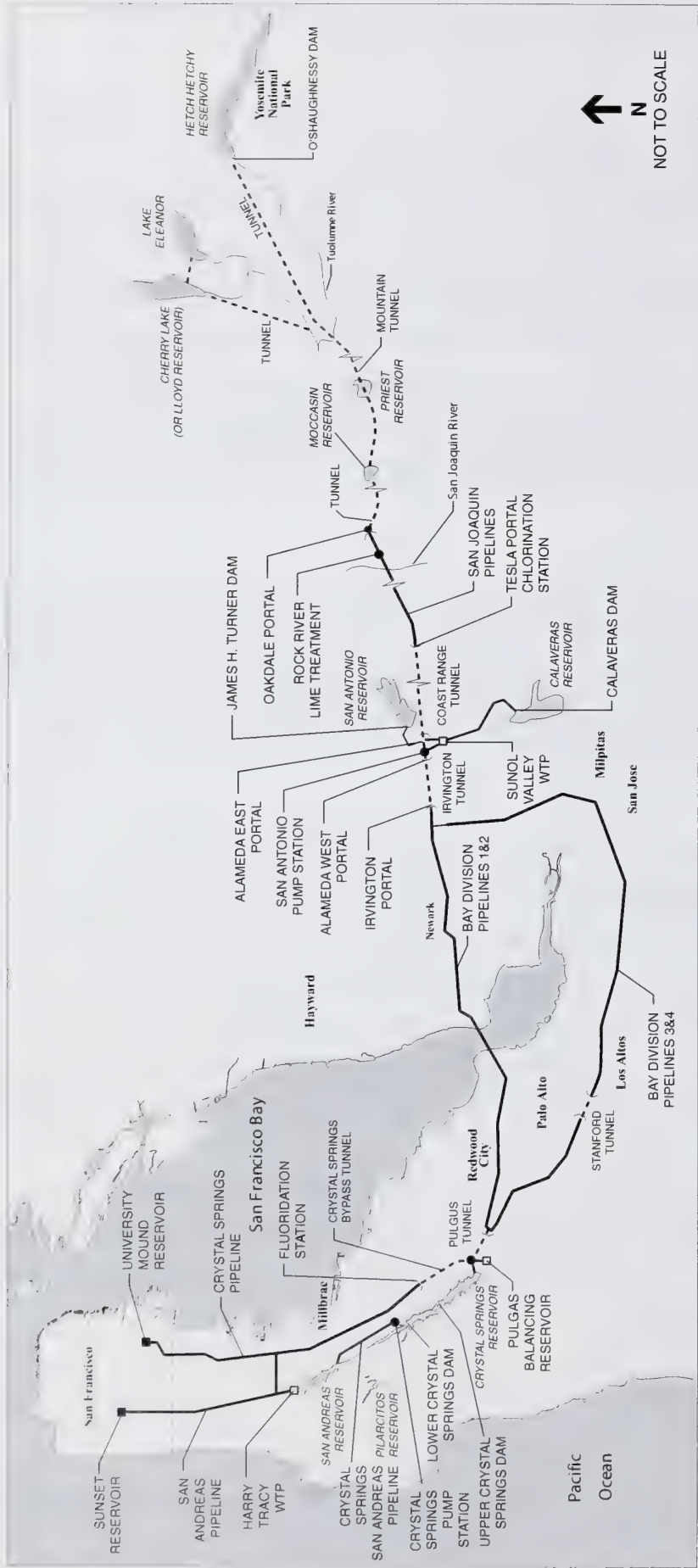


Figure 1
SFPUC Regional Water System
Calaveras Dam Replacement Project Draft EIR

SOURCE: San Francisco Public Utilities Commission (2005)



Calaveras Dam Replacement Project Draft EIR

These goals and objectives provide the basis for a series of facility improvement projects that the SFPUC would implement throughout the regional water system and for the implementation of water supply options to meet future annual water delivery needs during normal (non-drought) years, as well as current and future needs during droughts. Implementation of the Calaveras Dam Replacement Project would help meet the seismic reliability goal of the WSIP and, upon restoration of former water storage capabilities, help meet the delivery and drought reliability goals of the WSIP.

1.2 Environmental Review Process

The San Francisco Planning Department, Major Environmental Analysis (MEA) Division will prepare an Environmental Impact Report (EIR) to evaluate the environmental effects of the proposed Calaveras Dam Replacement Project. The EIR will be a Project EIR as defined in CEQA Guidelines Section 15161, and will address the project-specific impacts of the proposed project related to construction and operation. Early discussions between MEA and San Francisco District, U.S. Army Corps of Engineers (Corps) staff indicate that MEA and the Corps may prepare a joint EIR and National Environmental Policy Act (NEPA) Document. In such a case, the NEPA Document could be an environmental assessment (EA) or an environmental impact statement (EIS). Corps staff will make that decision pending verification of wetland delineations. The balance of this Notice of Preparation (NOP) assumes preparation of a joint EIR/NEPA Document.

The first step in the environmental review process is the formal public scoping process, for which this NOP has been prepared. Following public scoping meetings, a Draft EIR/NEPA Document will be prepared jointly by the Lead Agencies (MEA and the Corps) and circulated for a 45-day public review period. Public comments on the Draft EIR/NEPA Document will be accepted in writing or orally at a formal public hearing to be held by the San Francisco Planning Commission. The Lead Agencies will prepare written responses to comments on environmental issues raised during the public comment period, and a Responses to Comments Document will be prepared. This document will be considered by the Planning Commission, along with the Draft EIR and any revisions to the Draft included in the Responses, for certification as a Final EIR.

1.3 Public Scoping Meetings

The San Francisco Planning Department will hold two public scoping meetings at the following locations, dates, and times:

FREMONT – Monday, November 14, 2005, 6:30 p.m. - 8:30 p.m.

Fremont Main Library
2400 Stevenson Boulevard
Fremont, CA
(near Fremont BART station)

SAN FRANCISCO – Tuesday, November 15, 2005, 6:30 p.m. - 8:30 p.m.

San Francisco State University
425 Market Street, Room 301
San Francisco, CA
(near Embarcadero BART station)

The purpose of these meetings is to assist the Planning Department in reviewing the proposed scope and content of the EIR summarized in this NOP. The public will have the opportunity to comment and offer testimony for consideration. The San Francisco Planning Department will also accept written comments at the meetings or by mail or email until the close of business on November 30, 2005.

2.0 PROJECT DESCRIPTION

The Calaveras Dam Replacement Project has two components: replacement of the existing dam at Calaveras Reservoir to meet seismic safety and delivery/drought reliability requirements, and operation of Calaveras Reservoir to release up to 6,300 acre-feet per year of water to Calaveras and Alameda Creeks for enhancement of fisheries and the other natural resources of the creeks.

Calaveras Reservoir is located on the boundary of Alameda and Santa Clara Counties, approximately 10 miles southeast of Fremont, California (see Figure 2). Calaveras Dam is located at the northern end of the reservoir, approximately one mile upstream from the confluence of Calaveras and Alameda Creeks. Calaveras Reservoir is the largest San Francisco Bay Area (local) reservoir in the SFPUC's regional water system (at its historical storage capacity, Calaveras Reservoir retains approximately 40 percent of the SFPUC's total local water storage). On average, local water storage comprises approximately 15 percent of the SFPUC's total regional system storage, with the balance of storage located in the Sierra Nevada Mountains.

Calaveras Dam and Reservoir, as designed and operated prior to the California Department of Water Resources, Division of Safety of Dams (DSOD) restriction in 2001, allowed for retention of approximately 96,850 acre-feet of local runoff from Alameda, Calaveras, and Arroyo Hondo Creek watersheds. Because the dam is located near a seismically active fault zone and was determined to be vulnerable to strong earthquake ground motion, DSOD currently limits the reservoir water level to a maximum elevation that corresponds to about 38,100 acre-feet of storage, which is approximately 60 percent less than the previous normal maximum water storage capacity.

The proposed project includes a replacement dam that would be built immediately downstream of the existing dam to restore the reservoir's historical capacity of 96,850 acre-feet. The dam would be an earthen dam built to withstand the Maximum Credible Earthquake originating on the Calaveras Fault Zone and to withstand the Probable Maximum Flood. The design of the new dam (with a wide clay core and wide internal filter and drainage system) could accommodate enlargement of the dam in the future. SFPUC does not reasonably foresee the need for a larger dam beyond one that restores the reservoir's historical capacity; the dam would be designed to allow potential future reuse of dam components without requiring otherwise more extensive dam removal and rebuilding if an enlargement were ever undertaken in the future. Any enlargement in the future would require a new CEQA process and approvals of the new project, including but not limited to modification or replacement of the existing operating permit by DSOD and possible additional water rights from the State Water Resources Control Board (SWRCB).

For seismic safety purposes and improved operations and maintenance, the proposed replacement dam would include a new intake tower, as well as a new outlet valve for water releases necessary for environmental purposes. Dam design must be approved by DSOD, and DSOD staff will monitor construction.

The main elements of the proposed project are:

- The earthen dam with robust design (wide centrally located clay core, wide filter and internal drainage),
- An un-gated, curved, open chute spillway with a new stilling basin,
- A new intake tower connecting to an existing drain and three water inlet adits,
- Extension of the outlet pipe connecting to a relocated, fixed cone valve,
- A low volume cone valve for water releases for environmental purposes, and

- Installation of instrumentation such as piezometers and settlement monuments, including accelerometers to measure strong ground motions during earthquakes.

The replacement dam would be an earthen dam, with an impervious clay core, internal transition filter zone and drain, and pervious outer shells. The dam would be 220 feet tall (measured from the bottom of the foundation). The freeboard (vertical distance from the spillway crest to the dam crest, used to prevent overtopping of the dam) would be 21.6 feet. At the top of the dam, the elevation would be 778 feet.¹ The dam would be 1,130 feet long at the crest, 1,100 feet thick at the base, and 76 feet thick at the crest. Total volume of the earthen dam would be approximately 2.3 million cubic yards.

The new dam would be constructed at the downstream edge of the existing dam (see Figures 3 and 4). The existing dam would be used as a cofferdam² during construction of the replacement dam. The cofferdam would allow the reservoir to remain in operation up to the present restricted level and would also provide 100-year flood protection during construction. At the completion of the replacement dam, the cofferdam would be leveled off to an elevation of approximately 705 feet, and would be approximately 50 feet below the water level of the refilled reservoir. The excavated material from the cofferdam would be placed between the downstream slope of the cofferdam and the upstream slope of the replacement dam.

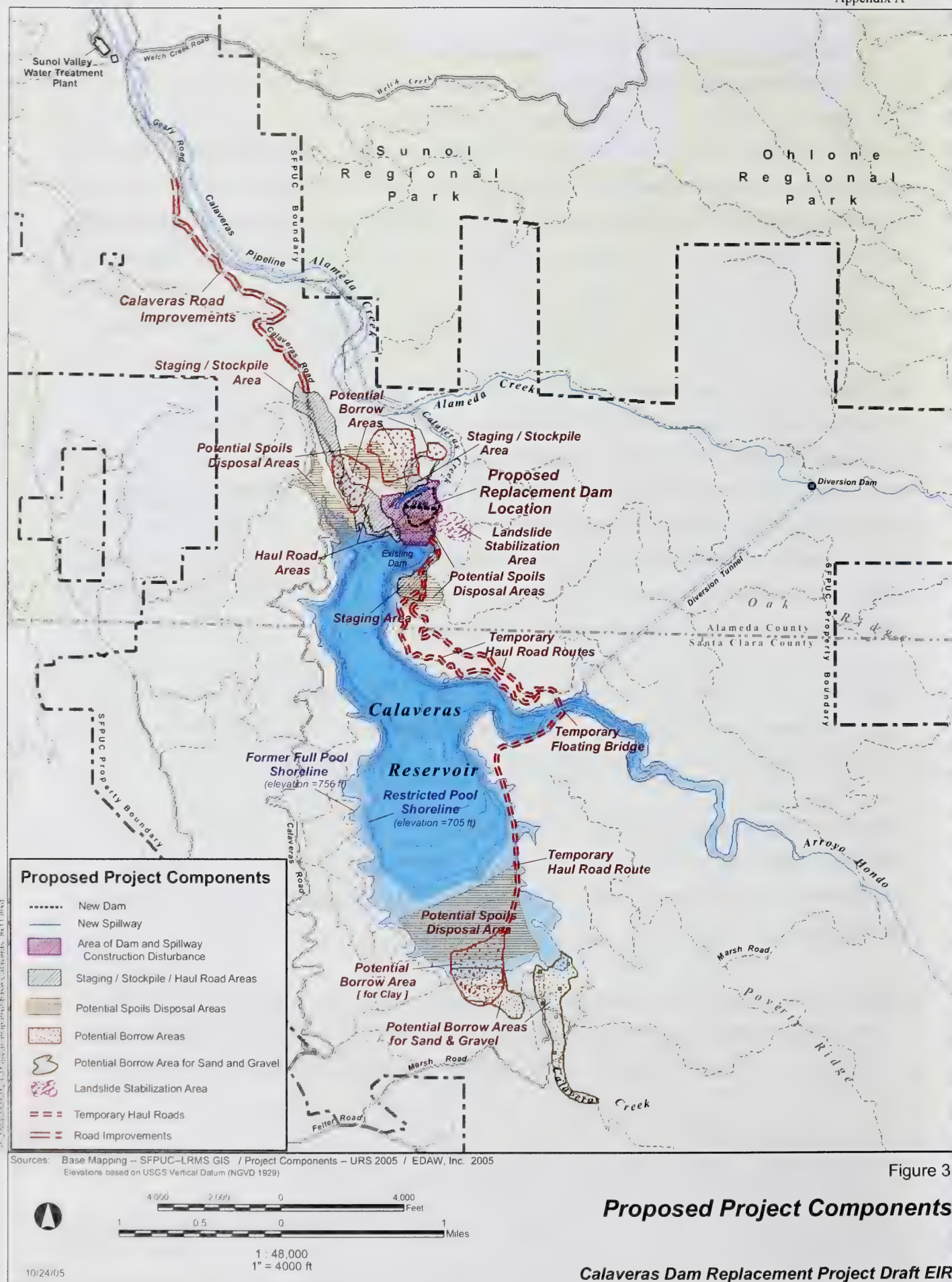
The new spillway would be located at the western end (left abutment) of the dam and would curve to the east to minimize rock excavation of the existing hillside. The spillway would be a rectangular, concrete-lined channel, 120 feet wide at the crest and 1,350 feet in length (including the stilling basin).

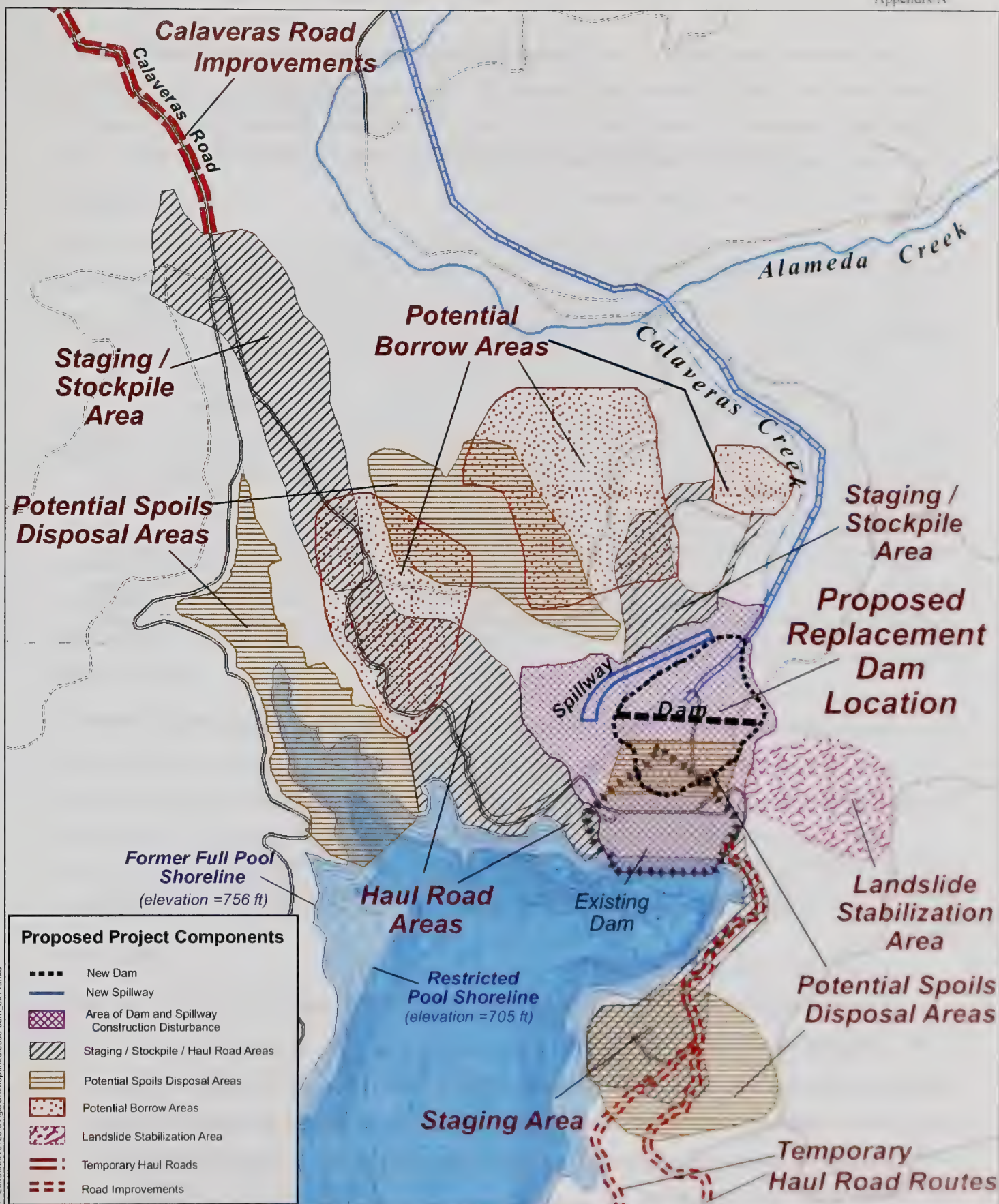
A new intake tower would be constructed on the existing outlet conduit approximately 60 feet downstream of the existing tower. The structure would consist of a circular reinforced concrete tower about 20 feet in diameter, connected to the shore by a bridge. The outlet piping, valves, and fish screens would all be new.

In addition to the spillway, there would be three means of releasing water from the dam: (1) an outlet conduit (existing Calaveras Pipeline) that would convey releases to the SVWTP, (2) a conduit that would discharge water to the spillway stilling basin below the dam and eventually to Calaveras Creek through a

¹ NGVD 1929 Datum. A datum is a line, point, or surface (such as sea level) used as a reference for elevation.

² A cofferdam is a temporary structure to keep water away from a construction site.





Sources: Base Mapping -- SFPUC--LRMS GIS / Aerial Image (if shown) -- HJW 2001 / Project Components -- URS 2005 / EDAW, Inc. 2005
Elevations based on USGS Vertical Datum (NGVD 1929)



1,000 500 0 1,000 Feet

1 : 12,000
1" = 1000 ft

10/24/05

Figure 4

Dam Construction Area

Calaveras Dam Replacement Project Draft EIR

72-inch diameter cone valve, and (3) a new 12-inch diameter pipe that would be connected to the 72-inch diameter outlet pipe through Calaveras Dam. Under a 1997 Memorandum of Understanding (MOU) with the California Department of Fish and Game (CDFG), the SFPUC is required to release up to 6,300 acre-feet per year of water from Calaveras Reservoir to Calaveras Creek. SFPUC would use this 12-inch diameter pipe to release water for this purpose.

Much of the material needed to construct the earthfill dam would be obtained from the required excavation of the new spillway and borrow areas in the vicinity of the reservoir (see Figure 3). Three potential borrow areas are located in the hills on the west side of Calaveras Creek, adjacent to and below the existing dam. Another potential borrow area is located at the south end of the reservoir. Sand and gravel for filters and drains would be imported from commercial sources or they could potentially be obtained from deposits in the vicinity of the southern borrow area. Three staging areas would be used for stockpiling of materials in the vicinity of the dam site. These staging areas would also be used for office trailers, site soils testing laboratory, and equipment and maintenance yards. A haul road would be constructed from the southern borrow area to the dam site as shown in Figure 3. The haul road would be located on the east shore of the reservoir. A portion of the haul road would incorporate existing roads that could be graded for this use. A temporary floating bridge would be placed across Arroyo Hondo Creek to move equipment across the creek.

Construction is planned to begin in the first quarter of 2009 and end in the fourth quarter of 2011.

Project Approvals

Following completion of environmental review, the San Francisco Public Utilities Commission would hold a public hearing to consider approval of the proposed project. Approvals would also be required from:

- United States Army Corps of Engineers
- California Department of Water Resources, Division of Safety of Dams
- California Department of Fish and Game

Review of the proposed project would also be conducted by the United States Environmental Protection Agency, United States Fish and Wildlife Service, State Office of Historic Preservation, the San Francisco Bay Regional Water Quality Control Board, San Francisco Bay Area Air Quality Management District, and National Marine Fisheries Service.

3.0 POTENTIAL ENVIRONMENTAL EFFECTS

3.1 Key Environmental Issues

The following key environmental issues will be analyzed in the EIR/NEPA Document.

Biological Resources

Construction of the project could impact sensitive biological resources. Sensitive habitat types and special status species that would be most likely to be affected by potential habitat losses and disturbance are: sycamore alluvial woodland, Calliope silverspot butterfly habitat, bay checkerspot butterfly habitat, rainbow trout, Sacramento perch, Pacific lamprey, California red-legged frog, foothill yellow-legged frog, California tiger salamander, Alameda whipsnake, most beautiful jewel flower, Cooper's hawk, Townsend's western big-eared bat, golden eagle, great blue heron, sharp-shinned hawk, and western pond turtle. The California red-legged frog, California tiger salamander, and the Alameda whipsnake are listed as "threatened" under the federal Endangered Species Act. The National Marine Fisheries Service (NMFS) has proposed the rainbow trout population in the Calaveras Reservoir watershed for listing as "threatened" under the federal Endangered Species Act. In addition, there are 26 federally or state-listed "species of concern" that have the potential to occur in the project area. Potential impacts to sensitive biological resources also include disturbance or temporary removal of aquatic habitats, such as wetlands and riparian areas.

Cultural Resources

Sensitive cultural resources that could be affected by the project include historical and prehistoric features that are protected by federal and state laws. A number of known cultural resource sites are recorded in the project area. Observations of prehistoric resources were documented during construction of the existing dam. Impacts would also involve the built environment, as features associated with the 1920s-era Calaveras Dam and appurtenant facilities would be demolished or substantially altered.

Water Quality

Potential water quality impacts caused by construction of the project could include:

- Increased sedimentation in Calaveras Creek upstream of the reservoir by use of a potential borrow area in close proximity to the creek,
- Increased sedimentation in Calaveras Reservoir through construction activities, and
- Increased sedimentation in Calaveras and Alameda Creeks downstream of the new dam from various construction activities.

Traffic and Transportation

Traffic disruption along Calaveras Road would occur during construction. Much of Calaveras Road is one lane and experiences a low volume of traffic. Recreational bicycle traffic also uses the roadway. The section of Calaveras Road between Felter Road and Geary Road would likely be used as a major hauling route for imported materials used in dam construction. For safety reasons, this section would need to be closed to the public for the duration of construction. The road would remain open to emergency vehicles. The section of Calaveras Road north of Geary Road would remain open during construction and there would be public safety concern during periods of heavy hauling, which may include large volumes of haul trucks depending on the extent of off-site materials required for construction.

Other Environmental Issues

Other topics that will be addressed in detail in the EIR/NEPA document include visual impacts associated with the new dam, geology and seismicity risks associated with dam construction and operation, noise and air quality emissions during construction, hazards associated with accidental spills of hazardous substances into the reservoir and/or local creeks and potential contaminants encountered during construction, cumulative impacts that could occur from this project in combination with other projects planned in the area, and growth-inducing impacts associated with restoring the reservoir's historical water storage capacity. Where impacts would be significant, the EIR/NEPA document will identify and discuss feasible mitigation measures.

3.2 Alternatives

CEQA and NEPA require that an EIR or a NEPA Document evaluate a reasonable range of feasible alternatives to the project, or to the location of the project, that would attain most of the basic project objectives, but that could avoid or substantially lessen any of the significant effects of the project. In addition to the No Project alternative required by both NEPA and CEQA, the EIR/NEPA Document will evaluate an alternative type of dam in the proposed new location (i.e., one that would not be designed with a wide core that could accommodate enlargement of the dam in the future, if ever needed). It is anticipated that the scoping process may identify other alternative approaches to avoid potentially significant impacts of the proposed project.

Appendix B

Public Scoping Process Summary Report

San Francisco Planning Department

**Public Scoping Process
Summary Report**

for the

Calaveras Dam Replacement Project EIR

June 2006

Prepared for the San Francisco Planning Department

Prepared by

EDAW

**TURNSTONE
CONSULTING**

In conjunction with

Davis & Associates Communications

June 2006

SFPUC CALAVERAS DAM REPLACEMENT PROJECT SCOPING SUMMARY REPORT

- 1.0 Project Overview
- 2.0 Scoping Process
- 3.0 List of Commenters
- 4.0 Comment Tracking Tables
- 5.0 Scoping Comments Summary
 - 5.1 Comments Received During the Scoping Process
 - 5.2 Comments Received During the WSIP Scoping Process on the Calaveras Dam Replacement Project

Appendices

- A. NOP Cover Letter, NOP Notice, NOP
- B. Notices of Scoping Meetings
 - Legal Notice
 - Display Ad
- C. Scoping Meeting Materials
 - Agenda
 - Presentation
 - Sign-in Sheets
 - Speaker Cards
 - Written Comments
 - NOP Figures 3 and 4
 - WSIP “Look Ahead Schedule”
 - Calaveras Dam Replacement Fact Sheet
- D. Calaveras and WSIP Scoping Comments
- E. Transcriptions of Fremont and San Francisco Scoping Meetings
- F. Meeting Summary Minutes from Inter-Agency Scoping Meeting

SFPUC Calaveras Dam Replacement Project i
Case No. 2005.0161E

Public Scoping Report
Davis & Associates/ETJV

June 2006

1.0 PROJECT OVERVIEW

1.1 Background – Calaveras Dam and Reservoir

The Calaveras Dam and Reservoir is located on the boundary of Alameda and Santa Clara Counties in the Alameda Watershed near Fremont, California. It is one of the San Francisco Public Utilities Commission's (SFPUC) largest local reservoirs, providing storage for approximately 31 billion gallons of water collected from creeks within the watershed that represent nearly 40% of all storage capacity in the SFPUC local water system. In 2001, the SFPUC initiated studies related to the seismic stability of the dam due to increasing industry-wide concerns about hydraulic fill dams and the proximity of the dam to the Calaveras Fault (a seismically active fault zone). In response to the study findings regarding seismic safety and structural stability of the dam, and based on California Division of Safety of Dams (DSOD) mandate, the SFPUC lowered water levels at the Calaveras Reservoir to about 40% of its normal maximum capacity.

Given the significance of the Calaveras Dam and Reservoir to the SFPUC local water system, it is considered a high priority to build a replacement dam and also to restore the reservoir to historical water levels.

1.2 Proposed Project

The Calaveras Dam Replacement Project (Project), as proposed by the SFPUC, includes the replacement of the existing dam with one of equivalent height, restoration to full reservoir storage, and operation of the Calaveras Reservoir to release up to 6,300 acre-feet per year of water to Alameda Creek for the enhancement of fisheries and other natural resources of Calaveras and Alameda Creeks. The project would include a new intake tower, as well as an outlet valve for water releases necessary for environmental purposes.

The project is focused on addressing the following key objectives:

- Mitigating public safety concerns
- Restoring pre-restriction water quality
- Restoring pre-restriction water storage capacity
- Restoring pre-restriction operational reliability

The Calaveras Dam Replacement Project is part of the \$4.3 billion bond-funded Water System Improvement Program (WSIP) to repair, replace and seismically upgrade the Hetch Hetchy System's aging pipelines, tunnels, reservoirs and dams. The WSIP projects are designed to improve delivery reliability and SFPUC's readiness to meet water demand during seismic events, prolonged droughts and changing water quality regulations through the year 2030. A Program EIR (PEIR) that will assess the potential physical impacts of the WSIP is in preparation.

1.3 Environmental Review

The San Francisco Planning Department is the lead agency implementing environmental review under the California Environmental Quality Act (CEQA) for the proposed Calaveras Dam Replacement Project. The Planning Department's Major Environmental Analysis Division (MEA) is directing preparation of an Environmental Impact Report (EIR) for the project. CEQA requires that the decision-making body and the public be informed about the significant effects of a project and identify ways to avoid or reduce those effects prior to project approval. When a proposed project may have significant effects that are not reduced by mitigation measures

June 2006

included in a project, an EIR must be prepared. As part of the EIR process, the Planning Department conducted public scoping in November 2005 to obtain input from agencies and the public regarding the scope and focus of the EIR.

Additional environmental review will be conducted by the U.S. Army Corps of Engineers pursuant to the National Environmental Policy Act (NEPA). The Planning Department will coordinate its environmental review with that of the U.S. Army Corps of Engineers. Other public agencies that will be involved in reviewing the project include the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, National Marine Fisheries Service, California Department of Fish and Game, San Francisco Bay Regional Water Quality Control Board, and possibly the Bay Area Air Quality Management District.

Following consideration of the public comments received during the scoping process, the Planning Department will prepare a Draft EIR on the proposed Project. The Draft EIR will include a description of the existing environmental conditions on and around the project site, and will identify significant impacts on the physical environment that could be caused by construction or operation of the proposed project. The issues raised during the public scoping process will help to identify potentially significant impacts that should be studied in the EIR and the alternatives that should be discussed in the EIR.

2.0 SCOPING PROCESS

The purpose of scoping is to provide the CEQA lead agency with the opportunity to consult directly with interested public agencies, the public, and organizations and other interested parties on matters related to environmental effects associated with the project. The scoping process helps identify alternatives and mitigation measures that should be considered in the EIR. It also assists with the coordination of regulatory agencies, local agencies and other stakeholders who may have different views and concerns regarding environmental issues. Scoping activities can also serve as a means to engage a community, resolve issues early in the EIR process, and foster public participation in the environmental review process.

2.1 Public Notification

On October 24, 2005, the San Francisco Planning Department issued a Notice of Preparation (NOP) of an Environmental Impact Report and Notice of Public Scoping Meetings for the Project. The public comment period extended from October 26 through November 30, 2005. Public notice was provided in a number of ways.

- **NOP and Scoping Meeting Notice Mailing**

Over 1,110 copies of the NOP and Notice of Public Scoping Meeting were sent by certified mail to affected public agencies and by U.S. mail to interested groups and individuals during the week of October 24, 2005. The mailing list included the following project stakeholder groups:

- Elected Officials: 39 NOP Cover Letter / 18 Full NOP (sent U.S. mail)
- Public Agencies: 91 NOP Cover Letter / 32 Full NOP
- Public Agencies: 21 Full NOP (certified mail)
- Interest Groups (Environmental): 36 NOP Cover Letter / 41 Full NOP (sent U.S. mail)
- Other Interested Parties: 104 NOP Cover Letter / 55 Full NOP (sent U.S. mail)
- Native American Nations: 3 Full NOP (sent U.S. mail)
- Informational Repositories (State Clearinghouse, libraries): 5 Full NOP (sent U.S. mail)

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- Media Outlets: 137 Cover Notice (sent U.S. mail)
- Property Owners: 185 Cover Notice (sent U.S. mail)
- Local Residents: 344 Cover Notice (sent U.S. mail)

- **Legal Notices and Display Ads**

As additional notification, legal notices were placed in the *Tri-Valley Herald* (run date October 26), *Fremont Argus* (run date October 26), *Milpitas Post* (November 3), and the *San Francisco Chronicle* (run date October 26). Display ads were also placed in the *Tri-Valley Herald*, *Fremont Argus*, and the *Milpitas Post* (run date November 10).

- **Project Website Information**

NOP information related to the project was posted at the San Francisco Planning website at:

http://www.sfgov.org/site/planning_index.asp

NOP information was also posted at the San Francisco Public Utilities Commission website, under "Projects and Plans," at:

<http://www.sfwater.org/>

- **Copies of the NOP**

A copy of the NOP was available to anyone requesting one from the San Francisco Planning Department.

2.2 Scoping Meeting Overview

Two, 2-hour public scoping meetings were held to solicit input regarding project issues of concern to the community and identify potential environmental effects and potential alternatives to be considered in the environmental review process. The first meeting was held on November 14th in Fremont and the second meeting was held on November 15th in San Francisco. The meetings were attended by approximately 35 people (Fremont/30 attendees: 13 members of the public, 17 public agency members; and San Francisco/5 attendees: three members of the public, two public agency members). Meeting proceedings were documented electronically, audio recorded, and transcribed by a court reporter who made a verbatim written transcript of each meeting (Appendix E).

2.3 Scoping Meeting Presentations

The meeting format consisted of an overview provided by Diana Sokolove, EIR Coordinator with the San Francisco Planning Department, and a brief description of the proposed project presented by David Rogers, Project Manager with the SFPUC staff. Ms. Sokolove explained that the San Francisco Planning Department is the lead agency implementing CEQA for SFPUC projects. Ms. Sokolove summarized the CEQA process and the purpose of public scoping. She explained that the project sponsor, the SFPUC, must consider the information in the EIR before making a decision to approve, modify or disapprove the project.

The EIR schedule and upcoming milestones were reviewed:

2005 – 2006	Conduct technical and field studies
2007	Publish Draft EIR/public review of Draft EIR

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2007 Response to public comments on environmental issues
2007 Final EIR

Once the EIR is finalized it will be considered for certification by the San Francisco Planning Commission. After certification, the SFPUC will evaluate the proposed project in light of the information in the EIR prior to taking an action on the proposed project.

An overview of the project design and construction was provided by David Rogers of SFPUC.

2.4 Scoping Meeting Comments

During the public comment portion of the scoping meetings, attendees were given an opportunity to provide input regarding issues of concern to the community and identify environmental effects and potential alternatives to be considered in the environmental review process. Those individuals wishing to speak at the meeting filled out speaker cards, and those who did not wish to speak publicly were encouraged to fill out comment cards to document their written input related to the project. Meeting attendees were also reminded that project comments could be submitted by U.S. mail, electronic mail and by facsimile to San Francisco Planning Department representatives (Paul Maltzer, Environmental Review Officer and Diana Sokolove, MEA) through November 30, 2005 (the conclusion of the public comment period).

2.5 Inter-Agency Scoping Meeting

In addition to the two public scoping meetings and the public comment period, an inter-agency meeting was held on December 15, 2005, by the Planning Department to receive comments directly from state and federal agencies. The meeting was attended by representatives of the U.S. Army Corps of Engineers, the NEPA lead agency; the U.S. Environmental Protection Agency; the National Marine Fisheries Service; and the California Department of Fish and Game. Representatives of the U.S. Fish and Wildlife Service and the San Francisco Bay Regional Water Quality Control Board were also invited but were unable to attend. An abbreviated version of the presentation given at the two public scoping meetings was provided, and issues raised by the attending agencies were discussed. Meeting notes were prepared summarizing the discussion (Appendix F).

2.6 Comments Received During WSIP PEIR process

As part of the SFPUC's Water System Improvement Program (WSIP) scoping process, public comments were received related to projects within the program. Comments were accepted by U.S. mail, electronic mail and facsimile until October 24, 2005, which marked the conclusion of the WSIP public comment period. Comments were directed to the San Francisco Planning Department representatives (Paul Maltzer, Environmental Review Officer and Diana Sokolove, MEA). Several of the comment letters raised issues related to the Project.

2.7 Written Comments

As noted at the scoping meetings, written comments were accepted via U.S. mail, electronic mail, and fax addressed to Diana Sokolove or Paul Maltzer at the San Francisco Planning Department. Thirty-three comment documents were received during the public review period.

3.0 LIST OF COMMENTERS

Federal

National Marine Fisheries Service – Dick Butler, Santa Rosa Office Supervisor, Protected Resources Division, and Gary Stern, Fisheries Biologist, Bay Area Team Leader

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US Environmental Protection Agency – Mike Monroe, Environmental Scientist

State

California Department of Fish and Game – Scott Wilson, for Robert W. Floerke, Regional Manager Central Coast Region; Kristen Atkins, Environmental Scientist
State Water Resources Control Board – Katherine Mrowka, Chief, Watershed Unit 3

Regional

Bay Area Water Supply & Conservation Agency – Arthur R. Jensen, General Manager
East Bay Regional Park District – Brad Olson, Environmental Programs Manager

Local

Alameda County Flood Control and Water Conservation District – Mary Lim, Environmental Services Program Manager
Alameda County Water District – Paul Piraino, General Manager
City of Fremont, Planning Department – Barbara Meerjans, Senior Planner
Santa Clara Valley Water District – Amy Fowler, Special Programs Engineer

Interest Groups

Environmental

Friends of Sausal Creek – Eleanor Dunn, Volunteer/Member
Hayward Area Planning Association – Sherman Lewis, Chair
Restore Hetch Hetchy – Ron Good, Executive Director
San Francisco Architectural Heritage – Charles Edwin Chase, Executive Director
Sierra Club – Dan Sullivan, California Water Committee Chair; John Rizzo, Chair, San Francisco Bay Chapter; Richard Zimmerman, Loma Prieta Chapter Water Committee Chair; Vinnie Bacon
The Nature Conservancy – Daniel Olstein, Mount Hamilton Project Manager
Alameda Creek Alliance – Jeff Miller, Director
Stanford Legal Clinics on behalf of The Tuolumne River Trust – Holly Gordon, Stephen Lindholm, Justin Pidot

General

East Bay Conservation Corps Charter School – Laura Allen, Teacher

Project Area Community

Residents

Truman L. Burns, Lafayette
John G. H. Cant, Fremont
Dorothy Doremus, Milpitas
Stan Garcia, Sunol
David K. Garges, Union City
Susan Gearhart, Fremont
Caryle Holmes, Nevada City
Kevin Laird, Fremont
Kristin Ohlson, Oakland
Jim, Diana, and Ken Prola - San Leandro
Todd M. Ravazza, Dublin
Kenneth G. Snetsinger and Judith C. Etheridge, Sunol
Scott Stevenson, San Jose
James Swofford, San Jose

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4.0 COMMENT TRACKING TABLES

COMMENT TOPICS

Topic	Corresponding Commenters	
	Commenter	Comment Source
CALAVERAS DAM COMMENTS		
Aesthetics	Alameda Creek Alliance	Written comment letter No. 4
	East Bay Regional Park District	Written comment letter No. 13
Air Quality, Construction	East Bay Regional Park District	Written comment letter No. 13
Alternatives	Alameda Creek Alliance	Written comment letter No. 3
	Bay Area Water Supply & Conservation Agency	Written comment letter No. 7
Alternative to Promote Ecosystem Function and Protect Fish	Alameda Creek Alliance	Written comment letter No. 3
	Sierra Club (John Rizzo)	Written comment letter No. 25
Alternative Dam Not Designed to Accommodate Future Enlargement	Alameda Creek Alliance	Written comment letter No. 3
	California Department of Fish and Game	Written comment letter No. 9
	Restore Hetch Hetchy	Written comment letter No. 22
	Sierra Club (John Rizzo)	Written comment letter No. 25
Alternative Dam Larger Than Proposed	Bay Area Water Supply & Conservation Agency	Written comment letter No. 7
	Restore Hetch Hetchy	Written comment letter No. 22
	National Marine Fisheries Service	Inter-agency scoping meeting comment
	Santa Clara Valley Water District (Amy Fowler)	Public hearing comment, November 14 (AF-1)
	Sierra Club (Vinnie Bacon)	Public hearing comment, November 14 (VB-1)
Alternative Reservoir Fishery Release Schemes	Bay Area Water Supply & Conservation Agency	Written comment letter No. 7
	Sierra Club (John Rizzo)	Written comment letter No. 25

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COMMENT TOPICS (continued)

Topic	Corresponding Commenters	
	Commenter	Comment Source
Alternatives (continued)		
Alternative with Calaveras Reservoir at More than 98,000 af, with Pumping Plant	Restore Hetch Hetchy	Written comment letter No. 22
Alternatives That Do Not Change the Current Configuration	Sierra Club (John Rizzo)	Written comment letter No. 25
Alternatives with Different Approaches to Avoid Impacts to Habitat	Sierra Club (John Rizzo)	Written comment letter No. 25
Removal (and/or Re-operation, in some comments) of Alameda Creek Diversion Dam	Alameda Creek Alliance	Written comment letter No. 3
	Truman L. Burns	Written comment letter No. 8
	John G.H. Cant	Written comment letter No. 10
	Eleanor Dunn	Written comment letter No. 12
	Carlyle Holmes	Written comment letter No. 16
	Kevin Laird	Written comment letter No. 17
	Kristin Ohlson	Written comment letter No. 19
	Jim, Diana, and Ken Prola	Written comment letter No. 20
	Todd M. Ravazza	Written comment letter No. 21
	Scott Stevenson	Written comment letter No. 27
	The Nature Conservancy	Written comment letter No. 28
	USEPA	Inter-agency scoping meeting comment

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COMMENT TOPICS (continued)

Topic	Corresponding Commenters	
	Commenter	Comment Source
Biological Resources		
Special Status Species (Surveys, Mitigation)	Alameda Creek Alliance	Written comment letter No. 3
	Alameda Creek Alliance	Written comment letter No. 4
	Alameda Creek Alliance	Written comment letter No. 5
	California Department of Fish and Game	Written comment letter No. 9
	John G.H. Cant	Written comment letter No. 10
	East Bay Regional Park District	Written comment letter No. 13
	Hayward Area Planning Association	Written comment letter No. 15
	Carlyle Holmes	Written comment letter No. 16
	Jim, Diana, and Ken Prola	Written comment letter No. 20
	Todd M. Ravazza	Written comment letter No. 21
	Sierra Club (John Rizzo)	Written comment letter No. 25
	Scott Stevenson	Written comment letter No. 27
	The Nature Conservancy	Written comment letter No. 28
	Sierra Club (Vinnie Bacon)	Public hearing comment, November 14 (VB-1)
	CDFG	Inter-agency scoping meeting comment
General Effects on Habitat for Plants and Wildlife	East Bay Regional Park District	Written comment letter No. 13

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COMMENT TOPICS (continued)

Topic	Corresponding Commenters	
	Commenter	Comment Source
Biological Resources (continued)		
Fisheries		
<i>Habitat Restoration</i>	Alameda Creek Alliance	Written comment letter No. 3
	California Department of Fish and Game	Written comment letter No. 9
	John G.H. Cant	Written comment letter No. 10
	Eleanor Dunn	Written comment letter No. 12
	East Bay Regional Park District	Written comment letter No. 13
	David K. Garges	Written comment letter No. 14
	Hayward Area Planning Association	Written comment letter No. 15
	Carlyle Holmes	Written comment letter No. 16
	Kevin Laird	Written comment letter No. 17
	Kristin Ohlson	Written comment letter No. 19
	Jim, Diana, and Ken Prola	Written comment letter No. 20
	Todd M. Ravazza	Written comment letter No. 21
	Restore Hetch Hetchy	Written comment letter No. 22
	Scott Stevenson	Written comment letter No. 27
	The Nature Conservancy	Written comment letter No. 28
	Alameda Creek Alliance	Public hearing comment, November 14 (JM-1)
	Dave Garges	Public hearing comment, November 14 (DG-1)
	California Department of Fish and Game	Inter-agency scoping meeting comment

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COMMENT TOPICS (continued)

Topic	Corresponding Commenters	
	Commenter	Comment Source
Biological Resources (continued)		
Water Releases/ Stream Flows	Alameda Creek Alliance	Written comment letter No. 3
	Alameda Creek Alliance	Written comment letter No. 5
	Laura Allen	Written comment letter No. 6
	Truman L. Burns	Written comment letter No. 8
	California Department of Fish and Game	Written comment letter No. 9
	John G.H. Cant	Written comment letter No. 10
	Eleanor Dunn	Written comment letter No. 12
	David K. Garges	Written comment letter No. 14
	Hayward Area Planning Association	Written comment letter No. 15
	Carlyle Holmes	Written comment letter No. 16
	Kevin Laird	Written comment letter No. 17
	National Marine Fisheries Service	Written comment letter No. 18
	Kristin Ohlson	Written comment letter No. 19
	Jim, Diana, and Ken Prola	Written comment letter No. 20
	Todd M. Ravazza	Written comment letter No. 21
	Restore Hetch Hetchy	Written comment letter No. 22
	Scott Stevenson	Written comment letter No. 27
	The Nature Conservancy	Written comment letter No. 28
	Alameda Creek Alliance	Public hearing comment, November 14 (JM-1)
	National Marine Fisheries Service	Inter-agency scoping meeting comment

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COMMENT TOPICS (continued)

Topic	Corresponding Commenters	
	Commenter	Comment Source
Biological Resources (continued)		
<i>Fish Passage</i>	Alameda Creek Alliance	Written comment letter No. 3
	Laura Allen	Written comment letter No. 6
	Truman L. Burns	Written comment letter No. 8
	California Department of Fish and Game	Written comment letter No. 9
	John G.H. Cant	Written comment letter No. 10
	Eleanor Dunn	Written comment letter No. 12
	East Bay Regional Park District	Written comment letter No. 13
	David K. Garges	Written comment letter No. 14
	Hayward Area Planning Association	Written comment letter No. 15
	Carlyle Holmes	Written comment letter No. 16
	Kevin Laird	Written comment letter No. 17
	National Marine Fisheries Service	Written comment letter No. 18
	Kristin Ohlson	Written comment letter No. 19
	Restore Hetch Hetchy	Written comment letter No. 22
	Scott Stevenson	Written comment letter No. 27
	The Nature Conservancy	Written comment letter No. 28
	Alameda Creek Alliance	Public hearing comment, November 14 (JM-1)
	California Department of Fish and Game	Inter-agency scoping meeting comment
<i>Reservoir Fisheries</i>	Alameda Creek Alliance	Written comment letter No. 5
	California Department of Fish and Game	Written comment letter No. 9
	Carlyle Holmes	Written comment letter No. 16
	National Marine Fisheries Service	Written comment letter No. 18 (continued)

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COMMENT TOPICS (continued)

Topic	Corresponding Commenters	
	Commenter	Comment Source
Biological Resources (continued)		
<i>Reservoir Fisheries (continued)</i>	Jim, Diana, and Ken Prola	Written comment letter No. 20
	Todd M. Ravazza	Written comment letter No. 21
	Scott Stevenson	Written comment letter No. 27
<i>Other Mitigation</i>	Alameda Creek Alliance	Written comment letter No. 3
	California Department of Fish and Game	Written comment letter No. 9
	John G.H. Cant	Written comment letter No. 10
	East Bay Regional Park District	Written comment letter No. 13
	Carlyle Holmes	Written comment letter No. 16
	National Marine Fisheries Service	Written comment letter No. 18
	Jim, Diana, and Ken Prola	Written comment letter No. 20
	Todd M. Ravazza	Written comment letter No. 21
	Scott Stevenson	Written comment letter No. 27
<i>Fees and Permits</i>	California Department of Fish and Game	Written comment letter No. 9
<i>Construction</i>	Alameda Creek Alliance	Written comment letter No. 3
	Alameda Creek Alliance	Written comment letter No. 4
	Alameda Creek Alliance	Written comment letter No. 5
	East Bay Regional Park District	Written comment letter No. 13
	Carlyle Holmes	Written comment letter No. 16
	Jim, Diana, and Ken Prola	Written comment letter No. 20
	Todd M. Ravazza	Written comment letter No. 21
	Restore Hetch Hetchy	Written comment letter No. 22
	Kenneth G. Snetsinger and Judith C. Etheridge	Written comment letter No. 26
	Scott Stevenson	Written comment letter No. 27

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COMMENT TOPICS (continued)

Topic	Corresponding Commenters	
	Commenter	Comment Source
Cultural Resources	Restore Hetch Hetchy	Written comment letter No. 22
	San Francisco Architectural Heritage	Written comment letter No. 23
	James Swofford	Public hearing comment, November 14 (JS-1)
Cumulative Impacts	City of Fremont	Written comment letter No. 11
Flooding	City of Fremont	Written comment letter No. 11
	Restore Hetch Hetchy	Written comment letter No. 22
	John Cant	Public hearing comment, November 14 (JC-1)
Mitigation (General)	Alameda Creek Alliance	Written comment letter No. 3
	Hayward Area Planning Association	Written comment letter No. 15
	Kevin Laird	Written comment letter No. 17
Noise, Construction	East Bay Regional Park District	Written comment letter No. 13
Project Description		
Project Goals	Alameda Creek Alliance	Written comment letter No. 3
	Bay Area Water Supply & Conservation Agency	Written comment letter No. 7
	John Cant	Public hearing comment, November 14 (JC-1)
	USEPA	Inter-agency scoping meeting comment
Purpose and Need	Alameda Creek Alliance	Written comment letter No. 3
	Kenneth G. Snetsinger and Judith C. Etheridge	Written comment letter No. 26
	Alameda Creek Alliance	Public hearing comment, November 15 (JM-2)
	USEPA	Inter-agency scoping meeting comment
“Regional Reliability Benefits”	Restore Hetch Hetchy	Written comment letter No. 22

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COMMENT TOPICS (continued)

Topic	Corresponding Commenters	
	Commenter	Comment Source
Project Description (continued)		
Legal Framework (Including Props A and E)	Alameda Creek Alliance	Written comment letter No. 3
	California Department of Fish and Game	Written comment letter No. 9
	Sierra Club	Written comment letter No. 25
Cost	Susan Gearhart	Public hearing comments, November 14 (SuG-1)
Project Design and Operation		
Alert System	Alameda County Water District	Written comment letter No. 2
Recapture Facility (Rubber Dam)	Alameda Creek Alliance	Written comment letter No. 3
	Bay Area Water Supply & Conservation Agency	Written comment letter No. 7
	Hayward Area Planning Association	Written comment letter No. 15
Future Dam Enlargement	Alameda Creek Alliance	Written comment letter No. 3
	Alameda Creek Alliance	Written comment letter No. 4
	Bay Area Water Supply & Conservation Agency	Written comment letter No. 7
	California Department of Fish and Game	Written comment letter No. 9
	Restore Hetch Hetchy	Written comment letter No. 22
	Santa Clara Valley Water District	Written comment letter No. 24
	Sierra Club	Written comment letter No. 25
	Santa Clara Valley Water District (Amy Fowler)	Public hearing comments, November 14 (AF-1)
Purpose of Diversion Dam	Kenneth G. Snetsinger and Judith C. Etheridge	Written comment letter No. 26

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COMMENT TOPICS (continued)

Topic	Corresponding Commenters	
	Commenter	Comment Source
Public Safety	Dorothy Doremus	Public hearing comment, November 14 (DD-1)
Recreation	East Bay Regional Park District	Written comment letter No. 13
	Kenneth G. Snetsinger and Judith C. Etheridge	Written comment letter No. 26
Seismic Reliability	Restore Hetch Hetchy	Written comment letter No. 22
	Kenneth G. Snetsinger and Judith C. Etheridge	Written comment letter No. 26
	John Cant	Public hearing comments, November 14 (JC-1)
Traffic and Circulation during Construction	Alameda Creek Alliance	Written comment letter No. 4
	East Bay Regional Park District	Written comment letter No. 13
	Kenneth G. Snetsinger and Judith C. Etheridge	Written comment letter No. 26
	Carlyle Holmes	Written comment letter No. 16
	Stan Garcia	Public hearing comment, November 14 (StG-1)
Water Quality	Alameda County Flood Control and Water Conservation District	Written comment letter No. 1
	Alameda County Water District	Written comment letter No. 2
	East Bay Regional Park District	Written comment letter No. 13
Construction	Restore Hetch Hetchy	Written comment letter No. 22
	Alameda County Water District	Written comment letter No. 2

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COMMENT TOPICS (continued)

Topic	Corresponding Commenters	
	Commenter	Comment Source
Water Supply (Including Water Rights and Conservation)	Alameda County Water District	Written comment letter No. 2
	Alameda Creek Alliance	Written comment letter No. 3
	Bay Area Water Supply & Conservation Agency	Written comment letter No. 7
	John G.H. Cant	Written comment letter No. 10
	Restore Hetch Hetchy	Written comment letter No. 22
	Dorothy Doremus	Public hearing comments, November 14 (DD-1)
	John Cant	Public hearing comments, November 14 (JC-1)

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COMMENT TOPICS (continued)

Topic	Corresponding Commenters	
	Commenter	Comment Source
WSIP SCOPING COMMENTS RELATED TO THE CALAVERAS DAM REPLACEMENT PROJECT		
Aesthetics	East Bay Regional Park District	Written comment letter No. 30
Air Quality and Noise, Construction	East Bay Regional Park District	Written comment letter No. 30
Alternatives		
Removal of Alameda Creek Diversion Dam	Alameda Creek Alliance	Written comment letter No. 29
	Sierra Club (Dan Sullivan, John Rizzo, and Richard Zimmerman)	Written comment letter No. 31
Alternative to Avoid Impact to Sunol-Ohlone Regional Wilderness from Dam Expansion	Sierra Club (Dan Sullivan, John Rizzo, and Richard Zimmerman)	Written comment letter No. 31
Other Alternatives	Alameda Creek Alliance	Written comment letter No. 29
Biological Resources		
Special Status Species	Alameda Creek Alliance	Written comment letter No. 29
	East Bay Regional Park District	Written comment letter No. 30
	Sierra Club (Dan Sullivan, John Rizzo, and Richard Zimmerman)	Written comment letter No. 31
Effects on Habitat	East Bay Regional Park District	Written comment letter No. 30
Fisheries		
<i>Changes to Fish Population</i>	Sierra Club (Dan Sullivan, John Rizzo, and Richard Zimmerman)	Written comment letter No. 31
<i>Water Releases/Stream Flows/Fish Passage</i>	Alameda Creek Alliance	Written comment letter No. 29
	Sierra Club (Dan Sullivan, John Rizzo, and Richard Zimmerman)	Written comment letter No. 31
<i>Other Mitigation</i>	Alameda Creek Alliance	Written comment letter No. 29
Cumulative Impacts	Alameda Creek Alliance	Written comment letter No. 29
	Stanford Legal Clinics	Written comment letter No. 32
General Impacts	East Bay Regional Park District	Written comment letter No. 30

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COMMENT TOPICS (continued)

Topic	Corresponding Commenters	
	Commenter	Comment Source
Project Description		
Recapture Facility (Rubber Dam)	Alameda Creek Alliance	Written comment letter No. 29
	Sierra Club (Dan Sullivan, John Rizzo, and Richard Zimmerman)	Written comment letter No. 31
Legal Framework	Alameda Creek Alliance	Written comment letter No. 29
	Sierra Club (Dan Sullivan, John Rizzo, and Richard Zimmerman)	Written comment letter No. 31
Project Design and Operation		
Future Dam Enlargement	Sierra Club (Dan Sullivan, John Rizzo, and Richard Zimmerman)	Written comment letter No. 31
	Stanford Legal Clinics	Written comment letter No. 32
Public Safety	East Bay Regional Park District	Written comment letter No. 30
Recreation	East Bay Regional Park District	Written comment letter No. 30
Traffic, Construction	East Bay Regional Park District	Written comment letter No. 30
Water Quality	East Bay Regional Park District	Written comment letter No. 30
	Sierra Club (Dan Sullivan, John Rizzo, and Richard Zimmerman)	Written comment letter No. 31
Water Supply (Including Water Rights and Conservation)	State Water Resources Control Board, Division of Water Rights	Written comment letter No. 33

Complaint Inventory Table - Calaveras Dam Replacement EIR/NEPA Project

Letter No	Agency Name, Organization Name or Individual	Author's Last Name	Author's First Name	Title	Letter Title	Date	Values Received or Letter											
							1	2	3	4	5	6	7	8	9	10	11	12
1	Alameda County Flood Control and Water Conservation District (ACFCWD)	Tom	Mary	Environmental Program Manager	SFPUC Calaveras Dam Replacement Project Notice of Preparation (NAP) and Environmental Impact Report	November 18, 2005												X
2	Alameda County Water District (ACWD)	Pratt	Paul	General Manager	ACWD Comments to the SFPUC Calaveras Dam Replacement Project EIR Scope	November 19, 2005												X
3	Alameda Creek Alliance	Maur	Jeff	Director	Scoping Comments on Calaveras Dam Replacement Project	November 8, 2005												X
4	Alameda Creek Alliance	Maur	Jeff	Director	Supplemental Scoping Comments on Calaveras Dam Replacement Project	November 23, 2005												X
5	Alameda Creek Alliance	Maur	Jeff	Director	Supplemental Scoping Comments on Calaveras Dam Replacement Project and Long Term Project	December 20, 2005												
6	Alton - Individual	Alton	Laura	None	Calaveras Dam to-morrow	November 22, 2005												
7	San Jose Water Supply & Conservation Agency (JWASA)	Jerran	Arthur R	General Manager	Notice of Preparation - SFPUC Calaveras Dam Replacement Project (Case No. 2005-01818)	Received November 29, 2005												X
8	Burns - Individual	Burns	Thomas L	None	Calaveras Dam Replacement Project	November 17, 2005												
9	California Department of Fish and Game (CDFG)	Whelan	Scott	Regional Manager (Pesticide Branch)	Calaveras Dam Replacement Project SDH 2005-02102	November 22, 2005												X
10	Carl - Individual	Carl	John G H	None	SFPUC Calaveras Dam Replacement Project	Received November 29, 2005												X
11	City of Fremont	Morgan	Barbara	Senior Planner	Calaveras Dam Replacement EIR - Public Comments	November 30, 2005												
12	Individual - Don	Don	Elaine	None	Alameda Creek to-morrow	November 16, 2005												
13	East Bay Regional Park District	Dixon	Brian	Environmental Programs Manager	Scoping Comments for SFPUC Calaveras Dam Replacement Project (San Joaquin Regional Watersheds)	November 8, 2005												X
14	Gargis - Individual	Gargis	David K	None	Scoping Meeting - Written Comment (Form)	November 15, 2005												
15	Hayward Area Planning Association	Lova	Shirley	Chair	Comments on Calaveras Dam Replacement (e-mail)	December 1, 2005												X
16	Individual - Holmes	Holmes	Carlyle	None	Public Comment on the SFPUC Calaveras Dam Replacement Project (e-mail)	October 27, 2005												X
17	Laird - Individual	Laird	Kevin	None	Calaveras Dam Replacement Project (e-mail)	November 8, 2005												
18	National Marine Fisheries Service (NMFS)	Baker	Dan	Staff Fishery Science Supervisor (Regional Resources)	No Subject	November 10, 2005												
19	Obispo - Individual	Obispo	Kristin	None	Advisory for the Joint Alameda Creek to-morrow Dam Project (e-mail)	November 15, 2005												X
20	Proba - Individual	Proba	Jim	Diana and Ken	Calaveras Dam Replacement Project (e-mail)	November 16, 2005												X

Comment Inventory Table - Calaveras Dam Replacement EIR/NEPA Project

Letter No	Agency Name, Organization Name or Individual	Author's Last Name	Author's First Name	Title	Letter Title	Date	Response Based on Letter											
							Reviewed	Reviewed by	Reviewed on	Reviewed by	Reviewed on	Reviewed by	Reviewed on	Reviewed by	Reviewed on	Reviewed by	Reviewed on	Reviewed by
21	Reynolds - Individual	Reynolds	Todd M	None	Calaveras Dam EIR Comments (verbal)	October 17 2005												
22	Reserve High Hechty	Good	Ron	Executive Director	Scoping Report for EIR on SFPUUC Calaveras Dam Replacement	November 30 2005												
23	San Francisco Redwood Heritage	Chase	Charles Edwin	Executive Director	Calaveras Dam Replacement Project	November 17 2005												
24	State Class Valley Water District	Fowler	Ken	None	Scoping Meeting - Written Comment (Form)	December 15 2005												
25	Sigma Club	RLZ	John	San Francisco Bay Chapter	State No. 2005-1416E - San Francisco Bay Chapter Calaveras Dam Replacement Project Environmental Impact Report	November 30 2005												
26	Swilling and Edwards - Individual	Swilling	Kenneth G	None	Unlinked	November 15 2005												
27	Stevenson - Individual	Stevenson	Scott	None	Unlinked	November 23 2005												
28	The Nature Conservancy	Chilton	Daniel	Marcel Hamilton Project Manager	Scoping Comments for the San Francisco Public Utilities Commission's Program Environmental Impact Report on the Calaveras Dam Replacement Project	November 22 2005												

Comment Inventory Table - Calaveras Dam Replacement EIR/NEPA Project

Public Hearing Comments (listed by date of hearing/order of speakers)						
Speaker/Comment No.	Representing Agency, Organization or Self	Last Name	First Name	Title	Additional Comments in Letters or Other Transmittal	Date of Hearing
1	Agencia de Agua de San Jose	Mateo	Jose	None	Letters 1, 2, 3 and 4, 5 and 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 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2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 209	

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5.0 CALAVERAS SCOPING COMMENTS SUMMARY

This section presents a summary of the comments received in letters and from testimony at public scoping meetings. The section is divided into comments received in the Calaveras Dam Replacement Project scoping process and documents received in the WSIP scoping process that raised issues related to the Calaveras Dam Replacement Project.

5.1 Comments from Calaveras Scoping Process

Comments covered a wide range of project-related issues ranging from project elements and analysis, to environmental impacts to species and habitat to seismic reliability. For the purposes of summarizing the various comment categories, several related topics have been grouped together with acknowledgement of who contributed remarks in said category. The topic categories listed below are arranged alphabetically.

Aesthetics

- Some of the proposed borrow sites will have significant visual and aesthetic impacts on the Sunol Regional Wilderness. *Jeff Miller, Alameda Creek Alliance (Letter No. 4)*
- The project has the potential to create adverse impacts to aesthetics. The DEIR must identify and fully mitigate such significant effects. *Brad Olson, Environmental Programs Manager – East Bay Regional Park District (Letter No. 13)*
- Perform a visual impact analysis regarding borrow sites, especially those in proximity to Sunol Regional Wilderness, including visual simulations of before and after project conditions, as seen from public roads, trails and parklands in Wilderness Park. *Brad Olson, Environmental Programs Manager, East Bay Regional Park District (Letter No. 13)*
- The proposed project could affect recreational activities in the watershed area. Nighttime construction, blasting or truck noise would impact campers and backpackers at Sunol and Camp Ohlone. Closure of roads and trails would impact hikers, equestrians and bicyclists where permitted. *Brad Olson, Environmental Programs Manager – East Bay Regional Park District (Letter No. 13)*

Air Quality

- The project has the potential to create adverse impacts to air quality. The DEIR must identify and fully mitigate such significant effects. *Brad Olson, Environmental Programs Manager – East Bay Regional Park District (Letter No. 13)*

Alternatives

- Request analysis of the following alternatives:
 - Alternative designed without expanded core. *John Rizzo, Chair – San Francisco Chapter/Sierra Club (Letter No. 25)*
 - Designing the dam with an expanded core would interfere with the necessary flexibility required for the PEIR and WSIP and should not be considered as an alternative. *Arthur Jensen, General Manager – Bay Area Water Supply & Conservation Agency (Letter No. 7)*

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- Alternative that enlarges the proposed dam in the future using a pumping plant to move aqueduct water into the larger reservoir, presenting the regional reliability benefits to the service area and management of wet year water supplies. *Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22); Amy Fowler, Santa Clara Valley Water District (Public hearing comment, November 14); Arthur Jensen, General Manager – Bay Area Water Supply & Conservation Agency (Letter No. 7); Vinnie Bacon, Sierra Club (Public hearing comment, November 14)*
- Alternative that provides for a larger dam and increased storage capacity at Calaveras Reservoir, beyond its historical capacity, to maximize the Reservoir’s potential for fulfilling the WSIP’s storage and supply requirements. *Arthur Jensen, General Manager – Bay Area Water Supply & Conservation Agency (Letter No. 7)*
- Alternative that considers alternative reservoir sizes and release schemes to meet water supply goals and provide fishery enhancement flows. *Arthur Jensen, General Manager – Bay Area Water Supply & Conservation Agency (Letter No. 7)*
- Alternatives that avoid impacts to listed species and their habitat, restore ecosystem function, and protect reservoir trout, including alternative locations. *Jeff Miller, Alameda Creek Alliance (Letter No. 3); John Rizzo, Chair, San Francisco Bay Chapter, Sierra Club (Letter No. 25)*

Alternatives that would restore ecosystem function below the Calaveras Dam and ADD, such as transporting sediment from above Calaveras Dam and/or the ADD to Alameda Creek below the dams through a bypass canal, fish ladder or discharge pipe; capturing and hauling spawning substrate from above Calaveras Dam and/or the ADD to Alameda Creek below the dams; periodically releasing scouring flows from Calaveras Reservoir that are adequate to maintain suitable spawning habitat below the dam; and placing suitable and appropriate woody debris in Alameda Creek below the dams to enhance spawning and rearing habitat. *Jeff Miller, Alameda Creek Alliance (Letter No. 3)*

- Alternatives that do not make changes to the current configuration, such as the new intake tower. *John Rizzo, Chair, San Francisco Bay Chapter, Sierra Club (Letter No. 25)*
- Alternatives describing different potential water releases from the SFPUC dams and the effects on fish and wildlife. *John Rizzo, Chair, San Francisco Bay Chapter, Sierra Club (Letter No. 25)*
- The Alameda Creek Fishery Enhancement Project should not be part of the Calaveras Dam Replacement Project. If the “Enhancement Project” is included in the Project EIR it must fully evaluate all potential environmental impacts, and should evaluate a full range of alternatives. *Jeff Miller, Alameda Creek Alliance (Letter No. 3)*
- Analyze the growth-inducing impacts from future reservoir enlargement. *Jeff Miller, Alameda Creek Alliance (Letter No. 4)*
- The California Department of Fish and Game (DFG) recommends that the Calaveras Reservoir dam not be built to accommodate future size increases (based on DFG’s concern that future increases of surface water elevation could impact the adfluvial population of steelhead trout and foothill yellow-legged frogs). Raising the surface water elevation could

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also have serious impacts to the California red-legged frog, the western pond turtle, Alameda whipsnake, Calliope silverspot butterfly, and a number of other special status plants and animals. *Scott Wilson, for Robert Floerke – Regional Manager Central Coast Region/California Department of Fish and Game (Letter No. 9)*

- The Alameda Creek Diversion Dam should be removed, re-operated or improved so that it does not block flows or fish passage. *Truman L. Burns, Lafayette (Letter No. 8); John G.H. Cant, Fremont (Letter No. 10); Eleanor Dunn, Volunteer/Member, Friends of Sausal Creek (Letter No. 12); Carlyle Holmes, Nevada City (Letter No. 16); Kevin P. Laird, Fremont (Letter No. 17); Kristin Ohlson, Oakland (Letter No. 19); Jim, Diana and Ken Prola, San Leandro (Letter No. 20); Todd M. Ravazza, Dublin (Letter No. 21); Scott Stevenson, San Jose (Letter No. 27); Daniel Olstein, Mount Hamilton Project Manager, The Nature Conservancy (Letter No. 28)*

Biological Resources

General

- The project has the potential to create adverse impacts to fisheries, plants and wildlife, special-status species. The DEIR must identify and fully mitigate such significant effects. *Brad Olson, Environmental Programs Manager – East Bay Regional Park District (Letter No. 13)*
- Evaluate all the environmental impacts resulting downstream associated with rebuilding of the Calaveras Dam. Impacts for consideration include seasonal impoundment in stream sections, impeding fish migration, preventing gene flow between trout populations, impounding stream flows, disrupting ecosystem function, and reducing habitat quality below these dams. *Jeff Miller, Alameda Creek Alliance (Letter No. 3); Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22)*

Effects on Steelhead Trout Population

- Discuss the SFPUC's contingency plans to protect the sensitive fishery resources of landlocked steelhead trout and Sacramento perch in Calaveras Reservoir. *Jeff Miller, Alameda Creek Alliance (Letter No. 5)*
- What structural changes are needed to support steelhead in the Alameda Creek watershed (e.g. what physical or social barriers need to be removed)? What would be the cost of removing those barriers to free movement of migrating steelhead in this watershed? *Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22)*
- Operation of the new Calaveras Dam will significantly affect efforts to restore steelhead in the Alameda Creek watershed. The seven to eight mile reach of Alameda Creek immediately below the new Calaveras Dam offers the greatest potential in watershed restoration of steelhead. *Dick Butler, Santa Rosa Area Office Supervisor/Protected Resources Division – National Marine Fisheries Service (Letter No. 18)*
- SFPUC needs to construct and operate the project to ensure protection and allow the restoration of the steelhead trout and take this issue into account before any new dams are built. The NMFS considers the Central Coast steelhead an Evolutionarily Significant Unit. *Jeff Miller, Alameda Creek Alliance (Public hearing comment, November 14); Dave Garges, Union City (Public hearing comment, November 14); Dick Butler, Santa Rosa Area Office*

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Supervisor/Protected Resources Division – National Marine Fisheries Service (Letter No. 18); Scott Wilson, for Robert Floerke – Regional Manager Central Coast Region/California Department of Fish and Game (Letter No. 9)

- The SFPUC recently completed the Calaveras Dam Oxygenation Project, to protect water quality and fish habitat in the reservoir. The oxygenation equipment should be used to expand suitable summer trout habitat in the reservoir, and benefits of oxygenation equipment to fish should be evaluated in the Project EIR. *Jeff Miller, Alameda Creek Alliance (Letter No. 3)*
- What are the dam construction impacts on steelhead trout and other trout now in Calaveras Reservoir and in Alameda and Calaveras Creeks? What are the construction impacts of elimination of barriers to Alameda Creek landlocked steelhead migration? *Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22)*

Fish Passage Measures

- Project operates in violation of state fish and wildlife protection laws by blocking fish habitat (impacting spawning and rearing activities) and needs to include a restoration component. The SFPUC should study the feasibility and benefits of: providing fish passage past the rebuilt Calaveras dam both upstream and downstream by bypass canal, fish ladder, or trap and truck operation; modification or removal of the Alameda Creek Diversion Dam; releasing water from Calaveras Dam to mimic full range of natural flow regimes downstream of the dam. The Project should consider restoring some of the natural process such as sediment, fish-spawning gravels and some other functions. *Jeff Miller, Alameda Creek Alliance (Letter No. 3 and public hearing comments, November 14 and November 15); John Cant, Alameda Creek Alliance (Public hearing comment, November 14); Scott Stevenson, San Jose (Letter No. 27); Todd Ravazza, Dublin (Letter No. 21); Daniel Olstein, Mount Hamilton Project Manager – The Nature Conservancy (Letter No. 28); Kevin Laird, Fremont (Letter No. 17); Eleanor Dunn, Friends of Sausal Creek Volunteer (Letter No. 12); Jim, Diana and Ken Prola, San Leandro (Letter No. 20); Kenneth Snetsinger and Judith Etheridge, Sunol (Letter No. 26); Kristin Ohlson, Oakland (Letter No. 19); Laura Allen, East Bay Conservation Corps Charter School – Oakland (Letter No. 6); Susan Gearhart, Fremont (Public hearing comment, November 14); Truman Burns, Lafayette (Letter No. 8)*
- Lowering the surface water elevation without establishing a fish passage mechanism puts land-locked steelhead trout at significant risk and SFPUC out of compliance with Fish and Game Code Section 5901. The project should have a specific plan to provide fish passage at the new Calaveras Reservoir dam and the Alameda Creek Diversion Dam, and a plan to screen (per California Department of Fish and Game screening criteria) at the new intake tower/audit(s) at Calaveras Reservoir and at the intake of the diversion at the Alameda Creek Diversion Dam. *Scott Wilson, for Robert Floerke – Regional Manager Central Coast Region/California Department of Fish and Game (Letter No. 9)*

Effects on Endangered, Threatened and Sensitive Species

- The Project needs comprehensive surveys for endangered/threatened species and unusual plants and should assess the impacts of projected operational scenarios around the construction sites. This study should also include a plan to preserve the existing population of steelhead trout during interim operations (preconstruction) and post construction operations at the Calaveras Dam. *(Letter No. 20) Jim, Diana and Ken Prola – San Leandro (Letter No. 13); Scott Wilson, for Robert Floerke – Regional Manager Central Coast*

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Region/California Department of Fish and Game (Letter No. 9); John G. H. Cant, Fremont (Letter No. 10); Jeff Miller, Alameda Creek Alliance (Letter No. 3); Brad Olson, Environmental Programs Manager – East Bay Regional Park District (Letter No. 13); Carlyle Holmes, Nevada City (Letter No. 16); Todd M. Ravazza, Dublin (Letter No. 21)

- The project should undertake a habitat-based stream assessment of Calaveras, Arroyo Hondo and Alameda creeks and identify species likely to be impacted by the Project. Any species newly identified should be added to the project assessment process. Also recommended is an assessment of the flora and fauna within and adjacent to the project area, with particular emphasis upon identifying endangered, threatened, and locally unique species and sensitive habitats (that fall under CEQA guidelines). *Scott Wilson, for Robert Floerke – Regional Manager Central Coast Region/California Department of Fish and Game (Letter No. 9)*
- Concerned about the dam enlargement harming the habitat and a number of sensitive (native fish populations) and endangered species such as the red legged frog, the yellow legged frog, the tiger salamander and the California Whipsnake. Analyze the potential growth inducing impacts and potential impacts to endangered and threatened species and their habitat from future reservoir enlargement. *Vinnie Bacon, Sierra Club (Public hearing comment, November 14); Brad Olson, Environmental Programs Manager – East Bay Regional Park District (Letter No. 13); Jeff Miller, Director, Alameda Creek Alliance (Letter No. 4)*
- Consider the impacts from expanding the dam beyond the current design capacity and flooding thousands of acres of habitat for rare and endangered species in the area adjacent to the Sunol and Ohlone Wilderness Areas. *John Rizzo, Chair, San Francisco Bay Chapter, Sierra Club (Letter No. 25)*
- Conduct comprehensive surveys to determine conclusively whether the Berkeley kangaroo rat (recently rediscovered by the East Bay Regional Park District, and known to have lived in the vicinity of the Calaveras Dam in the past) is present in the project area. If detected the SFPUC should consider mitigations related this species in the project area. *Scott Wilson, for Robert Floerke – Regional Manager Central Coast, California Department of Fish and Game (Letter No. 9); Jeff Miller, Alameda Creek Alliance (Letter No. 3)*
- Potential indirect impacts to species and habitat include traffic, noise, lights, dust and human disturbance and must be evaluated during the EIR. *Jeff Miller, Alameda Creek Alliance (Letter No. 3); Jim, Diana and Ken Prola – San Leandro (Letter No. 20)*
- Clearly show species habitat areas and proposed borrow and disposal areas. Prioritize use of borrow and disposal areas between the current maximum restricted water surface elevation and the original reservoir surface elevation. *Jeff Miller, Alameda Creek Alliance (Letter No. 4 and No. 5)*
- The project should include provisions for keeping construction roads and dirt fill areas, and borrow and disposal areas away from important habitat areas, especially those for listed and sensitive species. *Carlyle Holmes, Nevada City (Letter No. 16); Todd Ravazza (Letter No. 21); Scott Stevenson (Letter No. 27)*

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Water Releases and Stream Flows

- It is important that the project guarantee stream flows to meet the Commission's legal responsibilities to protect native fish and wildlife, assuring conditions for spawning and rearing of steelhead trout (and restoring the ecosystem below Calaveras Dam and Alameda Creek Diversion Dam). *Sherman Lewis, Chair – Hayward Area Planning Association (Letter No. 15); Kristin Ohlson, Oakland (Letter No. 19); Truman Burns, Lafayette (Letter No. 8); Laura Allen, East Bay Conservation Corps Charter School – Oakland (Letter No. 6); Susan Gearhart, Fremont (Public hearing comment, November 14); John Cant, Alameda Creek Alliance (Letter No. 10)*
- California Department of Fish and Game (DFG) is concerned that currently the SFPUC has not released flows from Calaveras Dam to keep in good condition downstream aquatic resources in Alameda Creek. A hydrologic study should be conducted to determine the amount of water that is needed to support steelhead trout through critical reaches (and under various water year conditions) within the reaches affected by the Project. *Scott Wilson, for Robert Floerke – Regional Manager Central Coast Region/California Department of Fish and Game (Letter No. 9)*
- The NOP for the Project contemplates releasing water for environmental purposes from Calaveras Dam through a new 12" pipe and 72" low-volume cone valve. The EIR should identify whether this cone valve would be sufficient to release flows adequate for steelhead trout restoration, including flows needed for migration. *Jeff Miller, Alameda Creek Alliance (Letter No. 3)*
- How much stream release is needed to support a restored steelhead fishery in Alameda Creek watershed? List and explain the reasons why stream release requirements are not being met on Alameda Creek and other streams in this watershed. *Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22)*
- Provide information about the average annual natural stream flow (at the confluence of Calaveras and Alameda Creeks) to determine whether these flows meet or surpass the proposed minimum flows in the 1997 MOU. *Jeff Miller, Alameda Creek Alliance (Letter No. 3)*
- The project should include a specific proposal to provide minimum bypass flows for both Calaveras Dam and the Alameda Creek Diversion Dam for maintenance of habitat for fish and other aquatic species. *Scott Wilson, for Robert Floerke – Regional Manager Central Coast Region/California Department of Fish and Game (Letter No. 9)*
- Provide an assessment of the impacts of Calaveras Dam and the Alameda Creek Diversion Dam on channel forming flows with a specific proposal to provide periodic channel maintenance and flushing flows that are representative of the natural hydrograph that existed before the construction of the Calaveras Dam. *Scott Wilson, for Robert Floerke – Regional Manager Central Coast Region/California Department of Fish and Game (Letter No. 9)*
- A range of water releases should be considered in the EIR which provide for steelhead, spawning, incubation, rearing and migration below the dam. *Dick Butler, Santa Rosa Area Office Supervisor/Protected Resources Division – National Marine Fisheries Service (Letter No. 18); Sherman Lewis, Chair – Hayward Area Planning Association (Letter No. 15)*

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Cultural Resources

- Raising the reservoir above the present 37,500 af (and up to 98,000 af) may impact Native American sites and other cultural and historic sites. *Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22)*
- Three historic railroad bridges (identified in the project area) may be washed away by extended or abnormal water release in the project area. These transportation elements should be noted and addressed in the project EIR. *James Swofford, San Jose (Public hearing comment, November 14)*
- The project may require a cultural resource survey of the area of potential effect; impacts may be minimized through strict mitigation measures as determined by a historic preservation consultant. *Charles Chase, Executive Director - San Francisco Architectural Heritage (Letter No. 23)*

Cumulative Impacts (General)

- The EIR should appropriately evaluate the cumulative impacts to the City of Fremont. *Barbara Meerjans, Senior Planner, City of Fremont (Letter No. 11)*

Flooding

- Explain which areas are at risk for flooding below the Calaveras Reservoir (a replaced Calaveras Reservoir and one larger than 98,000 af). What is the predicted impact to Niles Canyon in particular, and Fremont generally, in the event of the failure of the Calaveras Dam or release of a large volume of water (please address timing and inundation area for flood waters in this area and effects to populated areas of Fremont). *Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22); Barbara Meerjans, Senior Planner – City of Fremont (Letter No. 11)*
- As a resident who lives at the mouth of Niles Canyon, concerned about the flooding risk when the Calaveras Dam and the others fail. *John Cant (Public hearing comment, November 14)*

Mitigation

- The removal of the Niles and Sunol Dams in no way mitigates for the environmental impacts of the proposed replacement and operation of the Calaveras Dam. *Jeff Miller, Alameda Creek Alliance (Letter No. 3)*
- Mitigations for the Project should include mitigations for impacts to areas beyond the footprint of the dam such as access roads, borrow, spoils and staging areas. The project should consider other potential sources for fill materials, including importing fill material from alternative sites that will not result in impacts to listed species or to the wilderness character of Sunol Regional Wilderness. Has the project included site restoration and preservation of endangered species habitat during construction? *Jeff Miller, Alameda Creek Alliance (Letter Nos. 3 and 4); Kenneth Snetsinger and Judith Etheridge, Sunol (Letter No. 26)*

Noise

- The proposed project will generate significant amounts of noise during construction of the dam, excavation or disposal of fill materials and transportation of materials on public

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roadways and unpaved roads in the Watershed. Potential blasting at the dam site or borrow sites may also disrupt wildlife and the recreating public. Such activities should be prohibited on weekends and during high use periods at Sunol Regional Wilderness. *Brad Olson, Environmental Programs Manager – East Bay Regional Park District (Letter No. 13)*

Project Description, Goals and Objectives

- In the SFPUC Purchase Estimates and Water Supply Options (draft June 28, 2005) all graphs are shown on a fiscal year basis. We ask that all planning, graphs, water balances and tables be based on a water year basis, Oct 1 through Sept 30 which is the most logical presentation to understand flow data. *Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22)*
- The EIR needs to include a project description that is compliant with all the legal obligations for environmental protection, including those required by Propositions A and E passed by voters in San Francisco in 2002. *John Rizzo, Chair – San Francisco Chapter/Sierra Club (Letter No. 25)*
- The NOP briefly mentions the Alameda Creek Diversion Dam and tunnel which are used to divert flow from upper Alameda Creek into the existing Calaveras Reservoir. These facilities should be addressed in the EIR if they are used to divert flow into the restored reservoir behind the new Calaveras Dam. *Dick Butler, Santa Rosa Area Office Supervisor/Protected Resources Division – National Marine Fisheries Service (Letter No. 18)*
- The Project needs to include minimum water releases from Calaveras adequate to support all native fish downstream, including steelhead trout. The 6,300 acre-feet of water mentioned in the project description is misleading and was intended for enhancing limited habitat for resident trout, not for migratory fish. *Jim, Diana and Ken Prola, San Leandro (Letter No. 20); Todd Ravazza, Dublin (Letter No. 21)*
- This project represents a unique opportunity to take steps to restore our salmonid resources. *Caryle Holmes, Nevada City (Letter No. 16)*
- A major failing of the proposed Project is the description of the purpose of and need for the Project. Stewardship and restoration actions need to be included in the project elements and description. The Project should acknowledge the SFPUC's stewardship obligations, legal requirements for environmental protection, and the public's desire for restoration actions. *Jeff Miller, Alameda Creek Alliance (Letter No. 3); Caryle Holmes, Nevada City (Letter No. 16)*
- The recent Parsons/CH2Mhill report to the SFPUC concluded that "activities reflecting the SFPUC's commitment to integrate the Stewardship Policy and Principles into the WSIP have not been made explicit" and have "not been fully applied to the program." The report recommended ensuring that the watershed stewardship policy is applied consistently to the program and to project-specific scopes. *Jeff Miller, Alameda Creek Alliance (Letter No. 3)*
- The project goals and purposes should be revised to include stewardship and restoration elements (i.e., Sunol and Niles Dam removal projects) allowing for migratory fish passage and minimizing environmental impacts of the project. *Jeff Miller, Alameda Creek Alliance (Public hearing comment, November 15)*

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- Please provide a rough outline of the regional reliability benefits to the service area, estimated impacts and cost of mitigations for increasing the reservoir to the full 600,000 af envisioned in the CIP at time people voted. *Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22)*
- Operations of the Alameda Creek Diversion dam need to be considered, since the dam is operated in coordination with the Calaveras Dam and fills the reservoir. The EIR needs to assess the downstream impacts, as well as direct physical impacts. *Jeff Miller, Alameda Creek Alliance (Public hearing comments, November 14 and November 15)*
- Requesting additional water disbursement to residents in the project area (now primary water supply comes from local wells, and building of a new development nearby is draining this source). *Dorothy Doremus, Milpitas (Public hearing comment, November 14)*

Project Design and Operation

- An alert system needs to be implemented by the SFPUC prior to construction and continuously maintained (by the SFPUC) for the life of the Calaveras Dam. The system must be capable of providing advance warning to all entities located downstream from the Calaveras Reservoir regarding time, rate and quality of flow of all water releases from Calaveras Reservoir into Alameda Creek. *Paul Piraino, General Manager – Alameda County Water District (Letter No. 2)*
- The Project NOP does not mention the SFPUC proposal to construct a water recapture facility (including rubber dam) in the Sunol Valley, the so-called “Alameda Creek Fishery Enhancement Project.” However, the NOP for the Programmatic EIR for the WSIP indicates this project will be part of the Calaveras Dam Replacement Project. The EIR should clarify whether or not this is an element of the proposed project. *Jeff Miller, Alameda Creek Alliance (Letter No. 3); Arthur Jensen, General Manager – Bay Area Water Supply & Conservation Agency (Letter No. 7)*
- The PUC should consider not building a rubber dam in Sunol Valley. *Sherman Lewis, Hayward Area Planning Association (Letter No. 15)*
- SFPUC must address and mitigate any negative impacts to Alameda Creek water supply that results from operation of the Calaveras Dam and/or Alameda Creek Diversion Dam. Believes most Californians support the need for water storage, water system flexibility and management of wet and drought year supply management. Important for SFPUC to preserve historical storage levels and also to look for opportunities to expand storage (in the regional water system). *Amy Fowler, Santa Clara Valley Water District (Public hearing comment, November 14); Paul Piraino, General Manager – Alameda County Water District (Letter No. 2)*
- The design and engineering of this project should be restricted to the 96,850 af of storage capacity identified as appropriate for replacing the existing dam. Engineering the structure for later expansion will increase threats to habitat in the two Regional Wilderness Areas adjacent to the dam, and is contrary to the SFPUC’s adopted stewardship policy. *Jeff Miller, Director, Alameda Creek Alliance (Letter No. 3)*
- Clarify purpose of Diversion Dam and whether it blocks fish migration. *Kenneth G. Snetsinger and Judith C. Etheridge (Letter No. 26)*

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Public Safety

- Potential fire danger associated with constructing the new dam and sparks generated by mechanical equipment. *Dorothy Doremus, Milpitas (Public hearing comment, November 14)*

Seismic Reliability

- Explain how expansion of Calaveras to 98,000 af and above 98,000 af can reduce the service area vulnerability to loss of service by earthquakes occurring east of Alameda Creek. *Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22)*
- Please provide a rough outline of the regional reliability benefits to the service area, estimated impacts and costs of mitigation for an increased reservoir built to the maximum size that now is considered to be earthquake safe? *Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22)*

Traffic

- Closure of Calaveras Road would decrease the safety of private vehicles by placing more cars on Calaveras Road north of the closure. Large construction vehicles would increase the risk of collision between construction vehicles and private vehicles. The EIR and EIS must identify and fully mitigate such significant effects. *Brad Olson, Environmental Programs Manager – East Bay Regional Park District (Letter No. 13)*
- Concerned about truck traffic and the associated deterioration of road conditions on Welch Creek Road, Calaveras and Geary Roads related to project activities. We would like to receive information about the safety concerns and about the number of trucks, hours of operation and the resident notification of activities. *Kenneth Snetsinger and Judith Etheridge, Sunol (Letter No. 26)*
- Concerned about truck traffic. *Stan Garcia, Sunol (Public hearing comment, November 14)*
- The Calaveras Dam replacement has the potential to create adverse impacts to traffic and circulation. The DEIR must identify and fully mitigate such significant effects. *Brad Olson, Environmental Programs Manager – East Bay Regional Park District (Letter No. 13)*
- The project must identify and fully mitigate any significant impacts associated with the proposed use of fill material if it were obtained at the Apperson Quarry and Sunol Regional Wilderness. *Jeff Miller, Alameda Creek Alliance (Letter No. 4)*

Water Quality

- Identify and implement Best Management Practices (BMPs) to prevent any discharges and/or spills that would degrade water quality in Alameda Creek. *Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22); Paul Piraino, General Manager – Alameda County Water District (Letter No. 2)*
- The project is located in unincorporated portion of Alameda and Santa Clara Counties and proposes to replace the existing Calaveras Dam in order to restore it to full design level and allow for releases of up to 6,300 acre-feet per year for fishery enhancement. Based on our review of the proposed project scope, we do not expect any impacts to our facilities. *Mary Lim, Environmental Services Program Manager – Alameda County Flood Control and Water Conservation District (Letter No. 1)*

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- The proposed project may result in similar significant impacts to water quality in downstream areas of Alameda Creek in the Sunol Regional Wilderness. The EIR and EIS should identify downstream impacts to Alameda Creek and implement mitigation measures. *Brad Olson, Environmental Programs Manager, East Bay Regional Park District (Letter No. 13)*
- Can construction and/or operation of a replacement Calaveras Dam affect local groundwater resources in Alameda and Santa Clara Counties? *Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22)*
- Any negative impacts to Alameda Creek water quality and quantity during construction of the project need to be addressed and mitigated, including any increases in water turbidity that would impact the ability of Alameda County Water District (ACWD) to use Alameda Creek flows for groundwater recharge. The DEIR must identify and fully mitigate such significant effects. *Paul Piraino, General Manager – Alameda Creek Water District (Letter No. 2)*

Water Supply (Including Water Rights and Conservation)

- Negative impacts to Alameda Creek water quality and quantity during construction of Calaveras Dam need to be addressed and mitigated. *Paul Piraino, General Manager, Alameda County Water District (Letter No. 2)*
- The EIR should clarify that the Project will result in a dam large enough to ensure restoration of the historical water supply yield provided by the Calaveras Reservoir, clarify if the water supply yield will be achieved in spite of sedimentation (and if silt removal will be required) and analyze the environmental impact associated with such removal. *Arthur Jensen, General Manager – BAWSCA (Letter No. 7)*
- How much would enlargement of Calaveras Reservoir above 98,000 af aid in water supply protection? *Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22)*
- It is questionable whether the SFPUC has a valid water right to renew these diversions since they have discontinued the filter gallery diversions and do not have an established beneficial use. Explain SFPUC's existing water rights in the Alameda Creek watershed and explain SF diversions from this watershed in light of these water rights. *Ron Good, Executive Director – Restore Hetch Hetchy (Letter No. 22); Jeff Miller, Alameda Creek Alliance (Letter No. 3)*
- Water supply is not adequate currently, and water must come from wells. Can these residents be included in disbursement since Milpitas does not provide water. *Dorothy Doremus (Public hearing comment, November 14)*
- Recommend that SFPUC take a leading role in water conservation and recycling. Believes that SFPUC could greatly influence this effort if they took more of a lead role of encouraging water conservation to consumers, jurisdictions within the system. *John Cant (Letter 10 and public hearing comment, November 14)*

5.2 Comments on Calaveras from WSIP Scoping Process

Alternatives

- The PEIR should consider project alternatives that: provide greater conservation programs and increased water reclamation instead of expanding water system capacity; do not expand

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water system capacity to withdraw water from the Tuolumne River and Alameda Creek; and improve freshwater flows for affected stream reaches in Alameda Creek and other SFPUC watersheds. *Jeff Miller, Alameda Creek Alliance (Letter No. 29)*

- The PEIR should include an analysis of one or more alternatives that would eliminate the concrete weir/rubber dam so that the released water is allowed to continue down Alameda Creek to San Francisco Bay. *Dan Sullivan, California Water Committee Chair – Sierra Club; John Rizzo, San Francisco Bay Chapter Chair – Sierra Club; Richard Zimmerman, Loma Prieta Chapter Water Committee Chair – Sierra Club (Letter No. 31)*
- The PEIR should include an analysis of alternatives that would result in compliance with California Fish and Game Code section 5937, including, at a minimum, removal of the Alameda Creek Diversion Dam. *Dan Sullivan, California Water Committee Chair – Sierra Club; John Rizzo, San Francisco Bay Chapter Chair – Sierra Club; Richard Zimmerman, Loma Prieta Chapter Water Committee Chair – Sierra Club (Letter No. 31)*
- Any expansion of Calaveras Dam beyond its current size will impact surrounding habitat and the Sunol-Ohlone Regional Wilderness. The PEIR should identify what those impacts will be and it should identify alternatives to avoid these impacts. *Dan Sullivan, California Water Committee Chair – Sierra Club; John Rizzo, San Francisco Bay Chapter Chair – Sierra Club; Richard Zimmerman, Loma Prieta Chapter Water Committee Chair – Sierra Club (Letter No. 31)*
- The Sierra Club is deeply concerned about the environmental impact of the expansion of the Calaveras Reservoir beyond its original capacity (96,850 af). In preparing the PEIR, the Planning Department should determine the actual capacity of the new Calaveras Dam that is projected as part of the WSIP. The PEIR should include analysis of the effect of a dam and reservoir of the size that the SFPUC actually plans to build, even if the SFPUC does not currently plan to expand the Calaveras Reservoir beyond its original capacity. *Dan Sullivan, California Water Committee Chair – Sierra Club; John Rizzo, San Francisco Bay Chapter Chair – Sierra Club; Richard Zimmerman, Loma Prieta Chapter Water Committee Chair – Sierra Club (Letter No. 31)*

Biological Resources

- The PEIR must consider the impacts of the Calaveras Dam replacement on aquatic and terrestrial habitat and listed species above and below the reservoir. *Jeff Miller, Alameda Creek Alliance (Letter No. 29)*
- The PEIR should evaluate the potential for changes in fish populations that cause them to drop below their current levels, and for fish populations that are currently listed as threatened or endangered under state or federal law. The PEIR should evaluate the potential for the Program to contribute to their recovery by increasing their populations in the rivers and creeks that are affected by the Program. *Dan Sullivan, California Water Committee Chair – Sierra Club; John Rizzo, San Francisco Bay Chapter Chair – Sierra Club; Richard Zimmerman, Loma Prieta Chapter Water Committee Chair – Sierra Club (Letter No. 31)*
- Surface water resource impacts from changes in water system operations, changes in primary versus secondary watershed status, changes in existing drainage patterns, increased erosion or deposition of sediments, impacts to riparian vegetation, fisheries and wildlife habitat. The

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DEIR must identify and fully mitigate such significant effects. *Brad Olson, Environmental Programs Manager – East Bay Regional Park District (Letter No. 30)*

- The project should include reservoir operations designed to protect landlocked reservoir trout population in Calaveras Reservoir. *Jeff Miller, Alameda Creek Alliance (Letter No. 29)*
- Watershed and ecosystem restoration, specifically habitat protection and enhancement for the SFPUC watersheds affected by the WSIP (Alameda Creek, the Tuolumne River and Peninsula watersheds) should be an explicit part of the program description, goals and objectives. The PEIR should specifically include funding for watershed improvement projects such as land acquisition and habitat restoration. *Jeff Miller, Alameda Creek Alliance (Letter No. 29)*

Instream Flows

- Since the proposed replacement for Calaveras Dam will block access for anadromous fish into the upper watershed the PEIR should evaluate the need and potential for increased stream flows below all SFPUC dams and diversions, to restore sufficient instream flows to sustain native fish in good condition. *Jeff Miller, Alameda Creek Alliance (Letter No. 29)*
- The WSIP program description states that “the SFPUC will manage its system improvements in a manner that...meets at a minimum all regulatory and legal obligations.” In light of this policy, the PEIR should include a determination of whether the Program will result in the SFPUC’s compliance with the California Fish and Game section 5937. *Dan Sullivan, California Water Committee Chair – Sierra Club; John Rizzo, San Francisco Bay Chapter Chair – Sierra Club; Richard Zimmerman, Loma Prieta Chapter Water Committee Chair – Sierra Club (Letter No. 31)*

Cumulative Impacts

- Examine the potential environmental impacts of future Bay Area storage projects (such as the future expansion of the Calaveras Reservoir) in concert with identified capacity and expansion projects in the WSIP (such as the fourth pipeline). *Holly Gordon, Stephen Lindholm, and Justin Pidot, Stanford Legal Clinics – Environmental Law (Letter No. 32)*
- The Additional 40 mgd Treated Water Supply and Sunol Valley WTP projects would allow the SFPUC to increase the rate and amount of water that could be removed and treated from Calaveras Reservoir. The new treated water reservoir could have a 5 acre footprint and impact the trout population as well as impact Sunol Valley habitat/species and increase the risk of chemical spills in Alameda Creek. Mitigations for all environmental impacts should be included in the project. *Jeff Miller, Alameda Creek Alliance (Letter No. 29)*

General Impacts

- The project has the potential for a number of adverse effects to Sunol Regional Wilderness, including impacts to fisheries, plant and wildlife, special status species, water and air quality, noise, aesthetics, recreation, traffic and circulation, and public safety. *Brad Olson, Environmental Programs Manager, East Bay Regional Park District (Letter No. 30)*

Project Description

- The relocation and re-engineering of the Calaveras Dam creates a foreseeable likelihood of a Calaveras Reservoir expansion and should be analyzed with respect to each environmental

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impact category. *Holly Gordon, Stephen Lindholm, and Justin Pidot, Stanford Legal Clinics - Environmental Law (Letter No. 32)*

- The project should include removal or re-operation of the Alameda Creek Diversion Dam from upper Alameda Creek or the dam to provide fish passage and reservoir operations designed to protect the landlocked reservoir trout population in Calaveras Reservoir. *Jeff Miller, Alameda Creek Alliance (Letter No. 29)*
- The project may create expanded use restrictions on District-leased watershed lands, and increase the potential for significant effects to Sunol Regional Wilderness and other regional parks. Impacts could result from water conveyance upgrades, maintenance facilities, treatment facilities, and collection and discharge facilities may adversely affect existing and planned trails and recreation in watershed areas (such as the Ohlone Wilderness Trail, Bay Ridge Trail, Niles Canyon Trail and other regional and locally operated trails). *Brad Olson, Environmental Programs Manager – East Bay Regional Park District (Letter No. 30)*
- Watershed Protection measures currently prohibit water contact recreation and bicycle usage and restrict dogs and livestock grazing in District-leased portions of Sunol Regional Wilderness. The SFPUC must address the multiple uses for which District parklands have been acquired and work cooperatively with the District in maintaining these uses within the Watershed. *Brad Olson, Environmental Programs Manager – East Bay Regional Park District (Letter No. 30)*

Traffic

- Potential closure of Calaveras Road, Geary Road or other unpaved access roads or trails to Sunol Regional Wilderness may adversely affect park users and police and fire services. The DEIR must identify and fully mitigate such significant effects. *Brad Olson, Environmental Programs Manager, East Bay Regional Park District (Letter No. 30)*

Water Supply (Including Water Rights and Conservation)

- The project listed in the NOP is a direct diversion project. Any new diversions must be accomplished pursuant to an appropriative right obtained from the State Water Resources Control Board (State Water Board). *Katherine Mrowka, Chief Watershed Unit 3 – State Water Resources Control Board (Letter No. 33)*
- An appropriative water right is also required for any increased diversion from Alameda Creek. Thus, the DEIR should include sufficient information for the State Water Board to use the document for water right permitting purposes. *Katherine Mrowka, Chief Watershed Unit 3 – State Water Resources Control Board (Letter No. 33)*

A. NOP COVER LETTER, NOP NOTICE, NOP

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October 24, 2005

To Responsible Agencies, Trustee Agencies, and Interested Parties:

**RE: CASE NO. 2005.0161E – SFPUC CALAVERAS DAM REPLACEMENT PROJECT
NOTICE OF PREPARATION OF AN ENVIRONMENTAL IMPACT REPORT AND
NOTICE OF PUBLIC SCOPING MEETINGS**

A Notice of Preparation (NOP) of an environmental impact report (EIR) pursuant to the California Environmental Quality Act (CEQA) and a Notice of Public Scoping Meetings for the above-referenced project, described below, has been issued by the San Francisco Planning Department. The NOP and Notice of Public Scoping Meetings is either attached or is available upon request from Diana Sokolove, whom you may reach at (415) 558-5971; diana.sokolove@sfgov.org; or at 30 Van Ness Avenue, Suite 4150, San Francisco, CA 94103. The combined NOP/Notice of Public Scoping Meetings will also be available online by October 24, 2005 at http://www.sfgov.org/site/planning_index.asp and www.sfwater.org (click on Projects and Plans, then Calaveras Dam Replacement).

Project Description: Calaveras Reservoir, located on the boundary of Alameda and Santa Clara Counties, approximately 10 miles southeast of Fremont, California, is the largest Bay Area reservoir in the San Francisco Public Utility Commission's regional water system. Calaveras Dam is located at the northern end of the reservoir, approximately one mile upstream from the confluence of Calaveras and Alameda Creeks. Because the dam is located near a seismically active fault zone and was determined to be seismically vulnerable, the California Department of Water Resources, Division of Safety of Dams (DSOD) has limited since 2001 the amount of water that can be stored in the reservoir to approximately 40 percent of its former full storage capacity (full storage capacity is 96,850 acre-feet of water) until the safety deficiencies are corrected. The Calaveras Dam Replacement Project, as proposed by the SFPUC, includes replacement of the existing dam with one of equivalent height, restored reservoir storage to its full design level, improved seismic design, and operation of Calaveras Reservoir to release up to 6,300 acre-feet per year of water for the enhancement of fisheries and the other natural resources of Calaveras and Alameda Creeks.

The new dam would be constructed at the downstream edge of the existing dam, and the existing dam would be used as a cofferdam (a structure to keep water away from a construction site) during construction of the replacement dam. The cofferdam would allow the reservoir to remain in operation up to the DSOD-restricted level during construction. For seismic safety purposes and improved operations and maintenance, the replacement dam would include a new intake tower, as well as a new outlet valve for water releases necessary for environmental purposes.

The San Francisco Planning Department, Major Environmental Analysis (MEA) Division, is preparing an EIR for consideration by decision-makers prior to a final decision by the SFPUC regarding whether to approve and implement the project. The purpose of the EIR is to provide information about potentially significant environmental effects of the proposed project, to identify possible ways to minimize those potentially significant effects, and to describe and evaluate feasible alternatives to the proposed project. Preparation of an NOP or EIR does not indicate a decision by the City to approve or to disapprove the

proposed project. However, prior to making any such decision, the decision makers must review and consider the information contained in the EIR.

The San Francisco Planning Department will hold two **PUBLIC SCOPING MEETINGS** at the places, dates, and times listed below. The purpose of these meetings is to receive oral comments to assist the San Francisco Planning Department in reviewing the scope and content of the project's environmental impact analysis and information to be contained in the EIR. Written comments will also be accepted at these meetings and until the close of business on November 30, 2005. Written comments should be sent to the San Francisco Planning Department, Attn: Paul Maltzer, Environmental Review Officer, Calaveras EIR, 30 Van Ness Avenue, Suite 4150, San Francisco, CA 94103, or provided via email to diana.sokolove@sfgov.org. MEA staff will transmit copies of all documents received during the public comment period to the U.S. Army Corps of Engineers (Corps) as the Corps may evaluate the effects of the proposed project under the National Environmental Policy Act (NEPA).

Scoping Meetings

Fremont

Monday, November 14, 2005, 6:30 p.m. - 8:30 p.m.
Fremont Main Library
2400 Stevenson Boulevard
Fremont, CA
(near Fremont BART station)



San Francisco

Tuesday, November 15, 2005, 6:30 p.m. - 8:30 p.m.
San Francisco State University
425 Market Street, Room 301
San Francisco, CA
(near Embarcadero BART station)



If you work for an agency that is a Responsible or Trustee Agency, we need to know the views of your agency as to the scope and content of the environmental information that is relevant to your agency's statutory responsibilities in connection with the proposed project. Your agency may need to use the EIR when considering a permit or other approval for this project. We will also need the name of the contact person for your agency. If you have questions concerning environmental review of the proposed project under CEQA, please contact Diana Sokolove at (415) 558-5971; if you have questions about NEPA review, please contact Robert Smith at (415) 977-8450.

**NOTICE OF PREPARATION OF AN ENVIRONMENTAL IMPACT REPORT AND
NOTICE OF PUBLIC SCOPING MEETINGS**

Date of this Notice:	October 24, 2005
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Lead Agency:	San Francisco Planning Department 30 Van Ness Avenue, Suite 4150 San Francisco, CA 94103
Agency Contact Person:	Diana Sokolove Email: diana.sokolove@sfgov.org Telephone: (415) 558-5971

Project Title:	Calaveras Dam Replacement Project
Project Sponsor:	San Francisco Public Utilities Commission
Project Contact Person:	Betsy Lauppe Rhodes Email: BLauppe@sfgwater.org Telephone: (415) 554-3240

Project Address:	Calaveras Dam and Reservoir
Assessor's Block and Lot:	Various
County:	Alameda and Santa Clara Counties

Project Description: Calaveras Reservoir, located on the boundary of Alameda and Santa Clara Counties, approximately 10 miles southeast of Fremont, California, is the largest Bay Area reservoir in the San Francisco Public Utility Commission's regional water system. Calaveras Dam is located at the northern end of the reservoir, approximately one mile upstream from the confluence of Calaveras and Alameda Creeks. Because the dam is located near a seismically active fault zone and was determined to be seismically vulnerable, the California Department of Water Resources, Division of Safety of Dams (DSOD) has limited since 2001 the amount of water that can be stored in the reservoir to approximately 40 percent of its former full storage capacity (full storage capacity is 96,850 acre-feet of water) until the safety deficiencies are corrected. The Calaveras Dam Replacement Project, as proposed by the SFPUC, includes replacement of the existing dam with one of equivalent height, restored reservoir storage to its full design level, improved seismic design, and operation of Calaveras Reservoir to release up to 6,300 acre-feet per year of water for the enhancement of the fisheries and other natural resources of the Calaveras and Alameda Creeks.

The new dam would be constructed at the downstream edge of the existing dam, and the existing dam would be used as a cofferdam (a structure to keep water away from a construction site) during construction of the replacement dam. The cofferdam would allow the reservoir to remain in operation up to the DSOD-restricted level during construction. For seismic safety purposes and improved operations and maintenance, the replacement dam would include a new intake tower, as well as a new outlet valve for water releases necessary for environmental purposes.

Please see the attached for more information about the proposed project, the scope of the EIR, and the anticipated environmental issues.

THIS PROJECT MAY HAVE A SIGNIFICANT EFFECT ON THE ENVIRONMENT; AN ENVIRONMENTAL IMPACT REPORT IS REQUIRED. This determination is based on the criteria of the Guidelines of the State Secretary for Resources, Section 15064 (Determining Significant Effect), and 15065 (Mandatory Findings of significance).

PUBLIC SCOPING MEETINGS will be held pursuant to the State of California Public Resources Code Section 21083.9 and California Environmental Quality Act Guidelines Section 15206 to receive oral comments concerning the scope of the EIR. Two meetings will be held at different locations: November 14, 2005 in Fremont and November 15, 2005 in San Francisco. Please see the attached for more information.

Written comments on the scope of the EIR will be accepted until the close of business on November 30, 2005. Written comments should be sent to the San Francisco Planning Department, Attn: Paul Maltzer, 30 Van Ness Avenue, Suite 4150, San Francisco, CA 94103 or sent by email to diana.sokolove@sfgov.org.

Documents relating to the proposed project are available for review, by appointment, at the San Francisco Planning Department's Major Environmental Analysis office, 30 Van Ness Avenue, Suite 4150. Please call Diana Sokolove at 415-558-5971 to schedule an appointment.

November 24, 2005
Date

Paul E. Maltzer for Paul Maltzer
Paul E. Maltzer, Environmental Review Officer

中文資料請電：(415) 558-6282

Para sa impormasyon sa Tagalog turnawag sa: (415) 558-6251

Para informacion en Espanol llamar al: (415) 558-6307

SFPUC CALAVERAS DAM REPLACEMENT PROJECT CASE NO. 2005.0161E

1.0 OVERVIEW

1.1 San Francisco Water System and Calaveras Dam

The City and County of San Francisco, through the San Francisco Public Utilities Commission (SFPUC), owns and operates a regional water system that extends from the Sierra Nevada Mountains to the San Francisco Bay Area, as shown in Figure 1. The regional water system serves 2.4 million people in San Francisco, San Mateo, Santa Clara, Alameda and Tuolumne Counties. The basic network of major facilities in the regional system was built from the late 1880s through the 1930s. Expansion and improvements of the major facilities continued through the 1970s. The Calaveras Dam and Reservoir, located in the East Bay Hills in Alameda and Santa Clara Counties, is part of the San Francisco water system.

Calaveras Reservoir receives runoff from the Calaveras Creek and Arroyo Hondo watersheds (a drainage area of approximately 100 square miles). During the wet season, water from Alameda Creek is diverted into Calaveras Reservoir through the Alameda Creek Diversion Dam and tunnel (see Figure 2). Water from Calaveras Reservoir flows through the Calaveras Pipeline to the Sunol Valley Water Treatment Plant (SVWTP) where it is treated for distribution.

Although the population within the SFPUC service area has steadily grown, ongoing repairs, maintenance, and upgrades have not kept pace with the overall system needs to meet increasing water demand from customers. Aging facilities within the system, some of which made use of now-outdated construction methods and materials, are currently in need of major repair, rehabilitation, upgrade, and/or replacement. In 2001, the California Department of Water Resources, Division of Safety of Dams (DSOD) imposed operating restrictions on Calaveras Dam due to seismic concerns. Until the dam safety deficiencies are corrected, the local storage capacity is reduced and normal system operation is impaired.

The SFPUC developed a regional Water System Improvement Program (WSIP) in February 2005 (see www.sfwater.org). The basic goals of the WSIP are to increase the reliability of the system with respect to water quality, seismic response, water delivery, and water supply to meet water purchase requests in the service area through the year 2030.

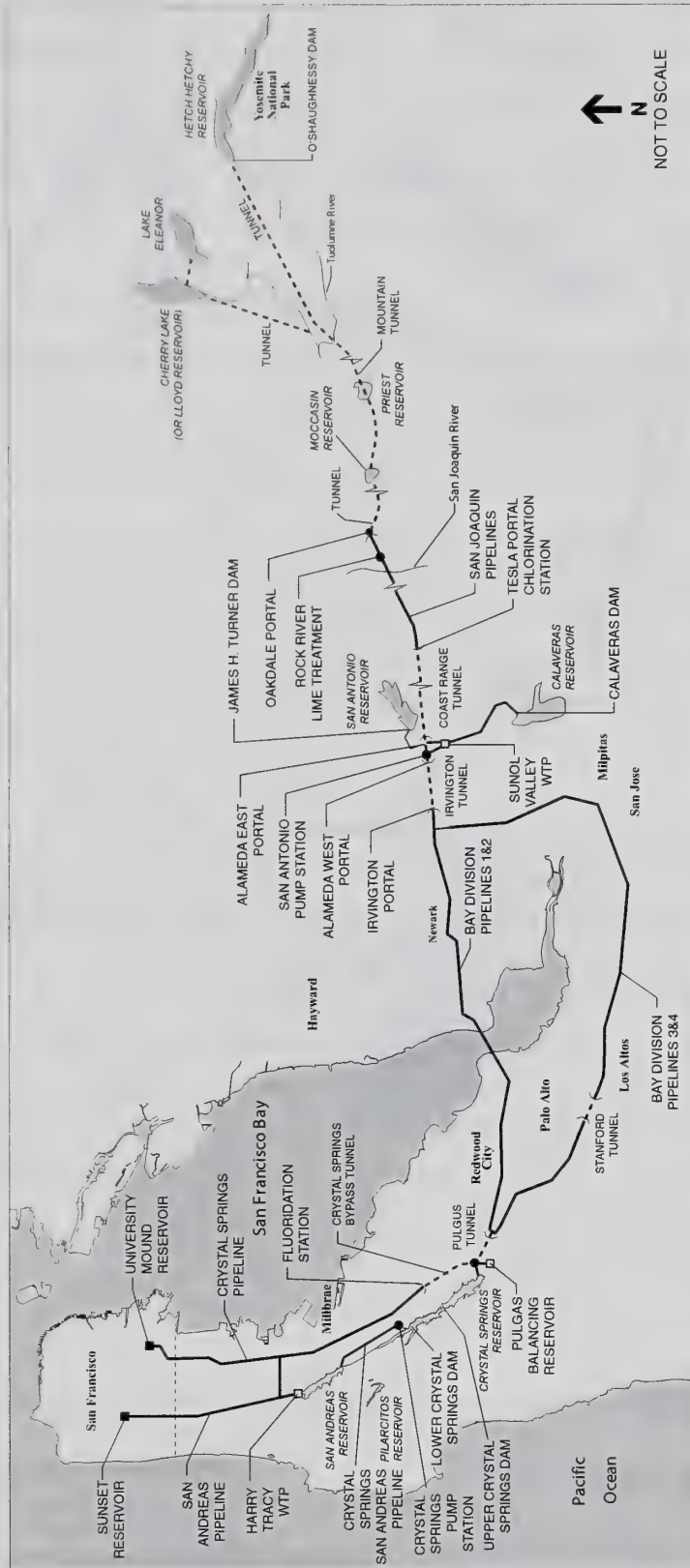
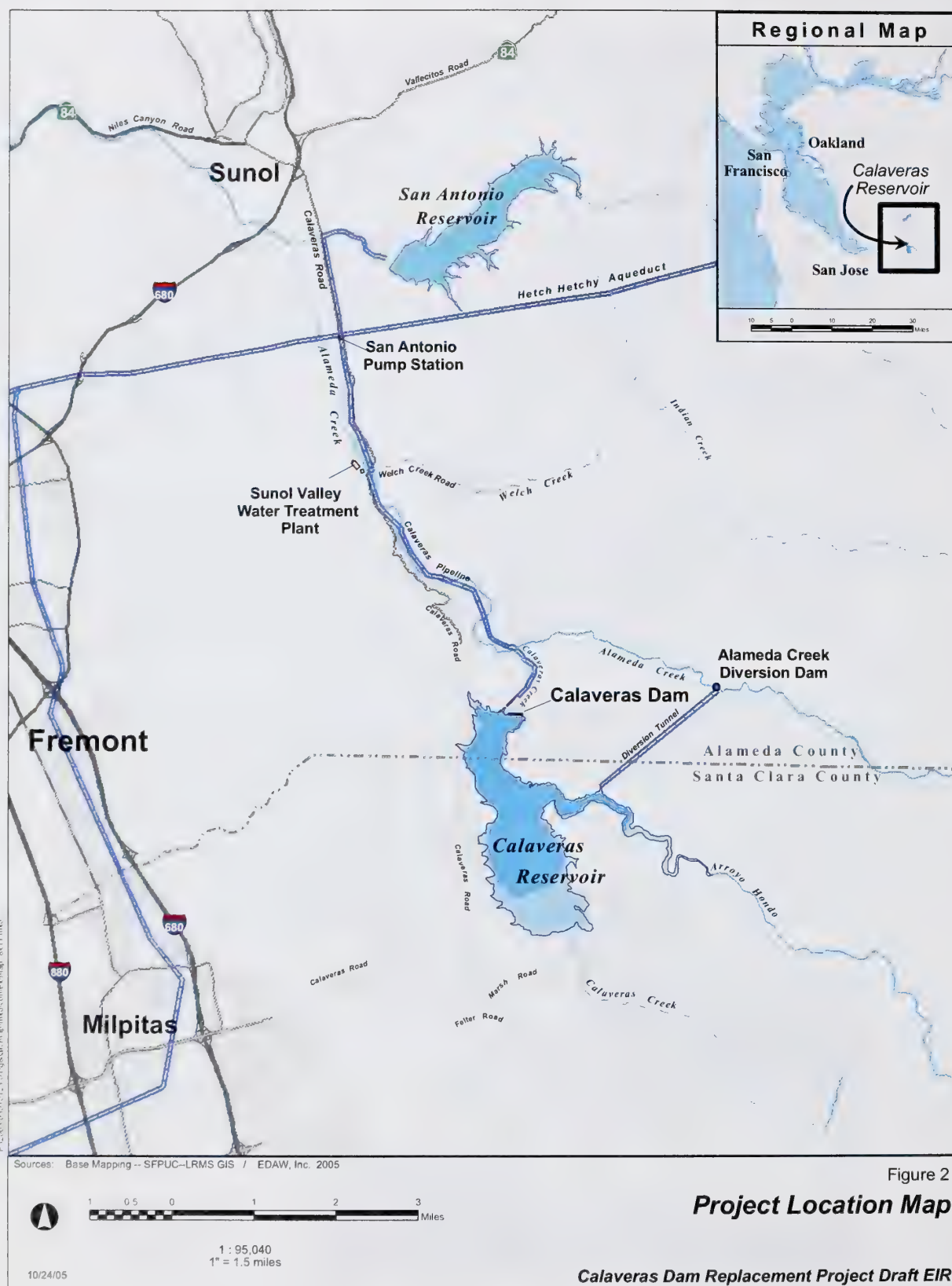


Figure 1
SFPUC Regional Water System

Calaveras Dam Replacement Project Draft EIR

SOURCE: San Francisco Public Utilities Commission (2005)



These goals and objectives provide the basis for a series of facility improvement projects that the SFPUC would implement throughout the regional water system and for the implementation of water supply options to meet future annual water delivery needs during normal (non-drought) years, as well as current and future needs during droughts. Implementation of the Calaveras Dam Replacement Project would help meet the seismic reliability goal of the WSIP and, upon restoration of former water storage capabilities, help meet the delivery and drought reliability goals of the WSIP.

1.2 Environmental Review Process

The San Francisco Planning Department, Major Environmental Analysis (MEA) Division will prepare an Environmental Impact Report (EIR) to evaluate the environmental effects of the proposed Calaveras Dam Replacement Project. The EIR will be a Project EIR as defined in CEQA Guidelines Section 15161, and will address the project-specific impacts of the proposed project related to construction and operation. Early discussions between MEA and San Francisco District, U.S. Army Corps of Engineers (Corps) staff indicate that MEA and the Corps may prepare a joint EIR and National Environmental Policy Act (NEPA) Document. In such a case, the NEPA Document could be an environmental assessment (EA) or an environmental impact statement (EIS). Corps staff will make that decision pending verification of wetland delineations. The balance of this Notice of Preparation (NOP) assumes preparation of a joint EIR/NEPA Document.

The first step in the environmental review process is the formal public scoping process, for which this NOP has been prepared. Following public scoping meetings, a Draft EIR/NEPA Document will be prepared jointly by the Lead Agencies (MEA and the Corps) and circulated for a 45-day public review period. Public comments on the Draft EIR/NEPA Document will be accepted in writing or orally at a formal public hearing to be held by the San Francisco Planning Commission. The Lead Agencies will prepare written responses to comments on environmental issues raised during the public comment period, and a Responses to Comments Document will be prepared. This document will be considered by the Planning Commission, along with the Draft EIR and any revisions to the Draft included in the Responses, for certification as a Final EIR.

1.3 Public Scoping Meetings

The San Francisco Planning Department will hold two public scoping meetings at the following locations, dates, and times:

FREMONT – Monday, November 14, 2005, 6:30 p.m. - 8:30 p.m.

Fremont Main Library
2400 Stevenson Boulevard
Fremont, CA
(near Fremont BART station)

SAN FRANCISCO – Tuesday, November 15, 2005, 6:30 p.m. - 8:30 p.m.

San Francisco State University
425 Market Street, Room 301
San Francisco, CA
(near Embarcadero BART station)

The purpose of these meetings is to assist the Planning Department in reviewing the proposed scope and content of the EIR summarized in this NOP. The public will have the opportunity to comment and offer testimony for consideration. The San Francisco Planning Department will also accept written comments at the meetings or by mail or email until the close of business on November 30, 2005.

2.0 PROJECT DESCRIPTION

The Calaveras Dam Replacement Project has two components: replacement of the existing dam at Calaveras Reservoir to meet seismic safety and delivery/drought reliability requirements, and operation of Calaveras Reservoir to release up to 6,300 acre-feet per year of water to Calaveras and Alameda Creeks for enhancement of fisheries and the other natural resources of the creeks.

Calaveras Reservoir is located on the boundary of Alameda and Santa Clara Counties, approximately 10 miles southeast of Fremont, California (see Figure 2). Calaveras Dam is located at the northern end of the reservoir, approximately one mile upstream from the confluence of Calaveras and Alameda Creeks. Calaveras Reservoir is the largest San Francisco Bay Area (local) reservoir in the SFPUC's regional water system (at its historical storage capacity, Calaveras Reservoir retains approximately 40 percent of the SFPUC's total local water storage). On average, local water storage comprises approximately 15 percent of the SFPUC's total regional system storage, with the balance of storage located in the Sierra Nevada Mountains.

Calaveras Dam and Reservoir, as designed and operated prior to the California Department of Water Resources, Division of Safety of Dams (DSOD) restriction in 2001, allowed for retention of approximately 96,850 acre-feet of local runoff from Alameda, Calaveras, and Arroyo Hondo Creek watersheds. Because the dam is located near a seismically active fault zone and was determined to be vulnerable to strong earthquake ground motion, DSOD currently limits the reservoir water level to a maximum elevation that corresponds to about 38,100 acre-feet of storage, which is approximately 60 percent less than the previous normal maximum water storage capacity.

The proposed project includes a replacement dam that would be built immediately downstream of the existing dam to restore the reservoir's historical capacity of 96,850 acre-feet. The dam would be an earthen dam built to withstand the Maximum Credible Earthquake originating on the Calaveras Fault Zone and to withstand the Probable Maximum Flood. The design of the new dam (with a wide clay core and wide internal filter and drainage system) could accommodate enlargement of the dam in the future. SFPUC does not reasonably foresee the need for a larger dam beyond one that restores the reservoir's historical capacity; the dam would be designed to allow potential future reuse of dam components without requiring otherwise more extensive dam removal and rebuilding if an enlargement were ever undertaken in the future. Any enlargement in the future would require a new CEQA process and approvals of the new project, including but not limited to modification or replacement of the existing operating permit by DSOD and possible additional water rights from the State Water Resources Control Board (SWRCB).

For seismic safety purposes and improved operations and maintenance, the proposed replacement dam would include a new intake tower, as well as a new outlet valve for water releases necessary for environmental purposes. Dam design must be approved by DSOD, and DSOD staff will monitor construction.

The main elements of the proposed project are:

- The earthen dam with robust design (wide centrally located clay core, wide filter and internal drainage),
- An un-gated, curved, open chute spillway with a new stilling basin,
- A new intake tower connecting to an existing drain and three water inlet adits,
- Extension of the outlet pipe connecting to a relocated, fixed cone valve,
- A low volume cone valve for water releases for environmental purposes, and

- Installation of instrumentation such as piezometers and settlement monuments, including accelerometers to measure strong ground motions during earthquakes.

The replacement dam would be an earthen dam, with an impervious clay core, internal transition filter zone and drain, and pervious outer shells. The dam would be 220 feet tall (measured from the bottom of the foundation). The freeboard (vertical distance from the spillway crest to the dam crest, used to prevent overtopping of the dam) would be 21.6 feet. At the top of the dam, the elevation would be 778 feet.¹ The dam would be 1,130 feet long at the crest, 1,100 feet thick at the base, and 76 feet thick at the crest. Total volume of the earthen dam would be approximately 2.3 million cubic yards.

The new dam would be constructed at the downstream edge of the existing dam (see Figures 3 and 4). The existing dam would be used as a cofferdam² during construction of the replacement dam. The cofferdam would allow the reservoir to remain in operation up to the present restricted level and would also provide 100-year flood protection during construction. At the completion of the replacement dam, the cofferdam would be leveled off to an elevation of approximately 705 feet, and would be approximately 50 feet below the water level of the refilled reservoir. The excavated material from the cofferdam would be placed between the downstream slope of the cofferdam and the upstream slope of the replacement dam.

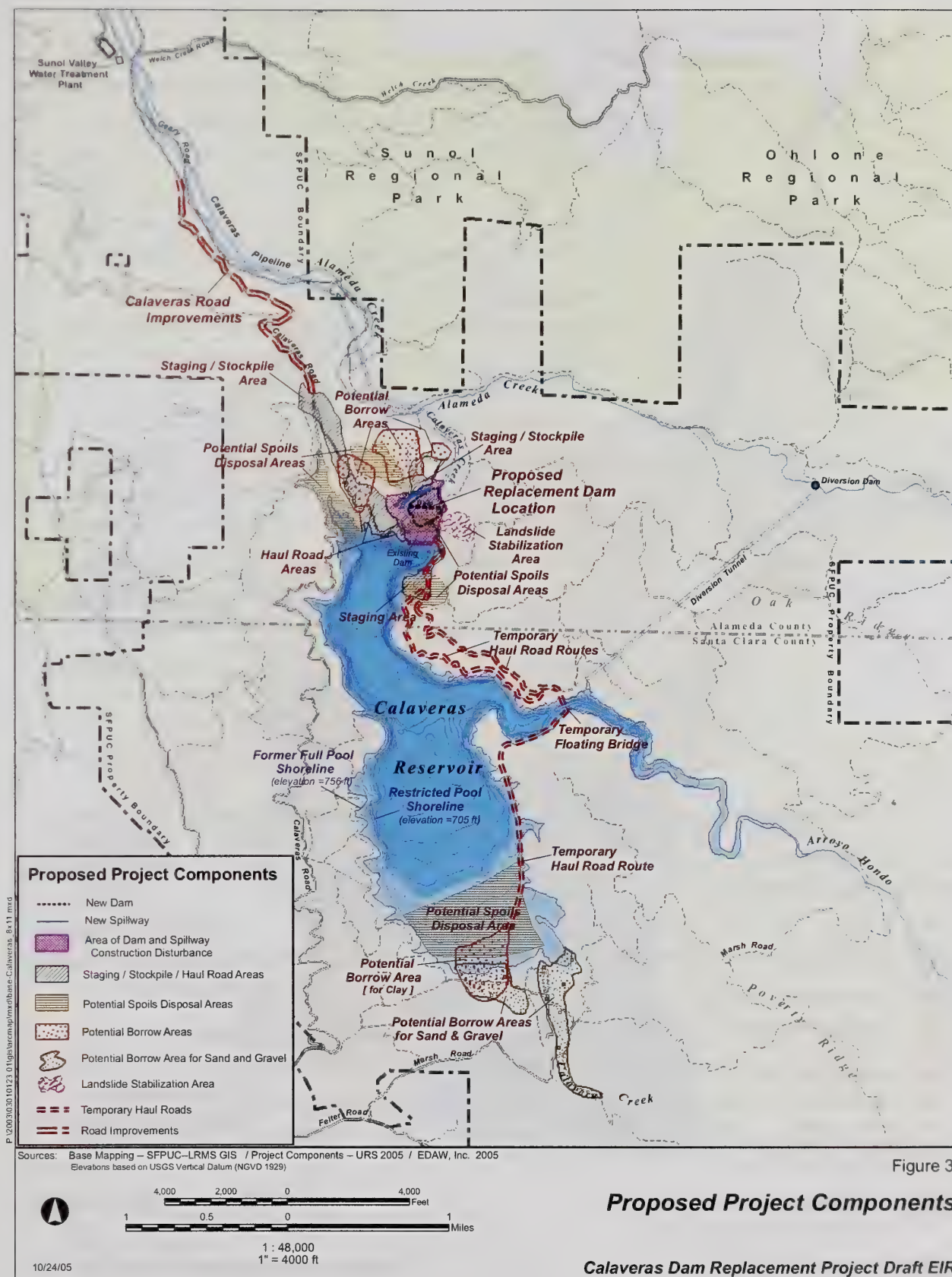
The new spillway would be located at the western end (left abutment) of the dam and would curve to the east to minimize rock excavation of the existing hillside. The spillway would be a rectangular, concrete-lined channel, 120 feet wide at the crest and 1,350 feet in length (including the stilling basin).

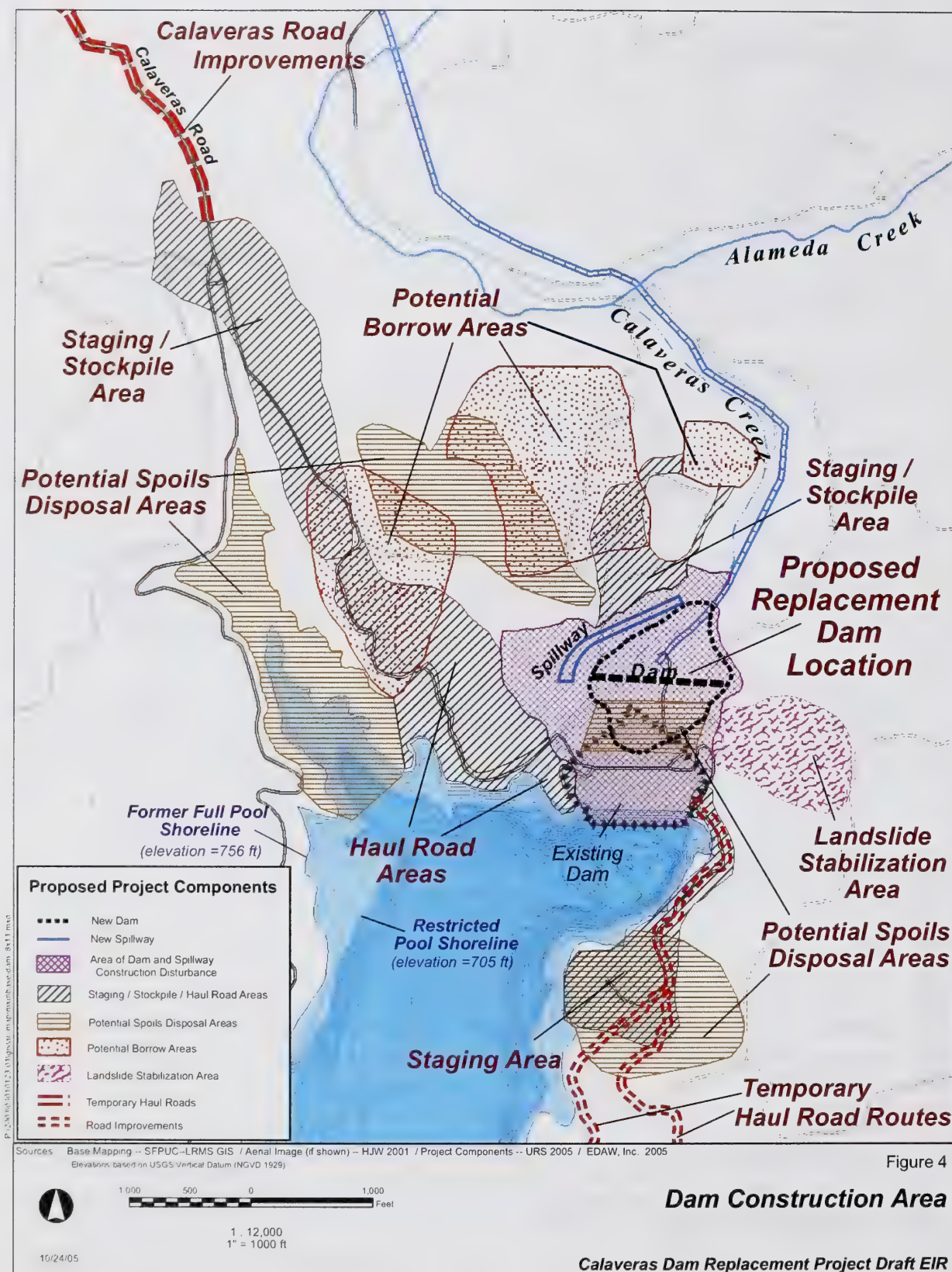
A new intake tower would be constructed on the existing outlet conduit approximately 60 feet downstream of the existing tower. The structure would consist of a circular reinforced concrete tower about 20 feet in diameter, connected to the shore by a bridge. The outlet piping, valves, and fish screens would all be new.

In addition to the spillway, there would be three means of releasing water from the dam: (1) an outlet conduit (existing Calaveras Pipeline) that would convey releases to the SVWTP, (2) a conduit that would discharge water to the spillway stilling basin below the dam and eventually to Calaveras Creek through a

¹ NGVD 1929 Datum. A datum is a line, point, or surface (such as sea level) used as a reference for elevation.

² A cofferdam is a temporary structure to keep water away from a construction site.





72-inch diameter cone valve, and (3) a new 12-inch diameter pipe that would be connected to the 72-inch diameter outlet pipe through Calaveras Dam. Under a 1997 Memorandum of Understanding (MOU) with the California Department of Fish and Game (CDFG), the SFPUC is required to release up to 6,300 acre-feet per year of water from Calaveras Reservoir to Calaveras Creek. SFPUC would use this 12-inch diameter pipe to release water for this purpose.

Much of the material needed to construct the earthfill dam would be obtained from the required excavation of the new spillway and borrow areas in the vicinity of the reservoir (see Figure 3). Three potential borrow areas are located in the hills on the west side of Calaveras Creek, adjacent to and below the existing dam. Another potential borrow area is located at the south end of the reservoir. Sand and gravel for filters and drains would be imported from commercial sources or they could potentially be obtained from deposits in the vicinity of the southern borrow area. Three staging areas would be used for stockpiling of materials in the vicinity of the dam site. These staging areas would also be used for office trailers, site soils testing laboratory, and equipment and maintenance yards. A haul road would be constructed from the southern borrow area to the dam site as shown in Figure 3. The haul road would be located on the east shore of the reservoir. A portion of the haul road would incorporate existing roads that could be graded for this use. A temporary floating bridge would be placed across Arroyo Hondo Creek to move equipment across the creek.

Construction is planned to begin in the first quarter of 2009 and end in the fourth quarter of 2011.

Project Approvals

Following completion of environmental review, the San Francisco Public Utilities Commission would hold a public hearing to consider approval of the proposed project. Approvals would also be required from:

- United States Army Corps of Engineers
- California Department of Water Resources, Division of Safety of Dams
- California Department of Fish and Game

Review of the proposed project would also be conducted by the United States Environmental Protection Agency, United States Fish and Wildlife Service, State Office of Historic Preservation, the San Francisco Bay Regional Water Quality Control Board, San Francisco Bay Area Air Quality Management District, and National Marine Fisheries Service.

3.0 POTENTIAL ENVIRONMENTAL EFFECTS

3.1 Key Environmental Issues

The following key environmental issues will be analyzed in the EIR/NEPA Document.

Biological Resources

Construction of the project could impact sensitive biological resources. Sensitive habitat types and special status species that would be most likely to be affected by potential habitat losses and disturbance are: sycamore alluvial woodland, Calliope silverspot butterfly habitat, bay checkerspot butterfly habitat, rainbow trout, Sacramento perch, Pacific lamprey, California red-legged frog, foothill yellow-legged frog, California tiger salamander, Alameda whipsnake, most beautiful jewel flower, Cooper's hawk, Townsend's western big-eared bat, golden eagle, great blue heron, sharp-shinned hawk, and western pond turtle. The California red-legged frog, California tiger salamander, and the Alameda whipsnake are listed as "threatened" under the federal Endangered Species Act. The National Marine Fisheries Service (NMFS) has proposed the rainbow trout population in the Calaveras Reservoir watershed for listing as "threatened" under the federal Endangered Species Act. In addition, there are 26 federally or state-listed "species of concern" that have the potential to occur in the project area. Potential impacts to sensitive biological resources also include disturbance or temporary removal of aquatic habitats, such as wetlands and riparian areas.

Cultural Resources

Sensitive cultural resources that could be affected by the project include historical and prehistoric features that are protected by federal and state laws. A number of known cultural resource sites are recorded in the project area. Observations of prehistoric resources were documented during construction of the existing dam. Impacts would also involve the built environment, as features associated with the 1920s-era Calaveras Dam and appurtenant facilities would be demolished or substantially altered.

Water Quality

Potential water quality impacts caused by construction of the project could include:

- Increased sedimentation in Calaveras Creek upstream of the reservoir by use of a potential borrow area in close proximity to the creek,
- Increased sedimentation in Calaveras Reservoir through construction activities, and
- Increased sedimentation in Calaveras and Alameda Creeks downstream of the new dam from various construction activities.

Traffic and Transportation

Traffic disruption along Calaveras Road would occur during construction. Much of Calaveras Road is one lane and experiences a low volume of traffic. Recreational bicycle traffic also uses the roadway. The section of Calaveras Road between Felter Road and Geary Road would likely be used as a major hauling route for imported materials used in dam construction. For safety reasons, this section would need to be closed to the public for the duration of construction. The road would remain open to emergency vehicles. The section of Calaveras Road north of Geary Road would remain open during construction and there would be public safety concern during periods of heavy hauling, which may include large volumes of haul trucks depending on the extent of off-site materials required for construction.

Other Environmental Issues

Other topics that will be addressed in detail in the EIR/NEPA document include visual impacts associated with the new dam, geology and seismicity risks associated with dam construction and operation, noise and air quality emissions during construction, hazards associated with accidental spills of hazardous substances into the reservoir and/or local creeks and potential contaminants encountered during construction, cumulative impacts that could occur from this project in combination with other projects planned in the area, and growth-inducing impacts associated with restoring the reservoir's historical water storage capacity. Where impacts would be significant, the EIR/NEPA document will identify and discuss feasible mitigation measures.

3.2 Alternatives

CEQA and NEPA require that an EIR or a NEPA Document evaluate a reasonable range of feasible alternatives to the project, or to the location of the project, that would attain most of the basic project objectives, but that could avoid or substantially lessen any of the significant effects of the project. In addition to the No Project alternative required by both NEPA and CEQA, the EIR/NEPA Document will evaluate an alternative type of dam in the proposed new location (i.e., one that would not be designed with a wide core that could accommodate enlargement of the dam in the future, if ever needed). It is anticipated that the scoping process may identify other alternative approaches to avoid potentially significant impacts of the proposed project.

B. NOTICES OF SCOPING MEETINGS

- Legal Notice
- Display Ad

SFPUC Calaveras Dam Replacement Project
Case No. 2005.0161E

Public Scoping Report
Davis & Associates/ETJV

FINAL LEGAL AD
10-20-05
Calaveras Dam Replacement Project

SF Chronicle – Oct 24
 Fremont Argus, Tri-Valley Herald – Oct 26
 Milpitas Post – Nov 3

**SAN FRANCISCO
 PLANNING DEPARTMENT
 NOTICE OF
 ENVIRONMENTAL REVIEW
 AND SCOPING MEETINGS**

The initial evaluation conducted by the San Francisco Planning Department determined that the San Francisco Public Utilities Commission's (SFPUC) proposed Calaveras Dam Replacement Project may have a significant effect on the environment. The San Francisco Planning Department will prepare an Environmental Impact Report (EIR) jointly with a National Environmental Policy Act (NEPA) Document, to be prepared by the United States Army Corps of Engineers (Corps). The San Francisco Planning Department issued a Notice of Preparation (NOP) on October 24, 2005.

Project Description (Case No. 2005.0161E). To address seismic safety requirements, the Calaveras Dam Replacement Project proposes to replace the existing dam with one of equal height and improved seismic design, as well as operation of Calaveras Reservoir to release up to 6,300 acre-feet per year of water to Alameda Creek for the enhancement of fisheries and other natural resources of Calaveras and Alameda Creeks. This seismic project is a key part of the SFPUC's Water System Improvement Program.

Public Scoping Meetings

The public is invited to attend upcoming scoping meetings to help identify the range of issues and type of information that should be considered by the San Francisco Planning Department in the EIR. The meetings are scheduled as follows:

Fremont: Monday, November 14, 2005
 6:30-8:30 PM Fremont Library
 2400 Stevenson Blvd.

San Francisco: Tuesday,
 November 15, 2005, 6:30-8:30 PM
 San Francisco State University
 (Downtown Campus), 425 Market Street,
 Room 301

How to Comment During Scoping

The San Francisco Planning Department will accept public comments on the scope and focus of the Calaveras Dam Replacement Project EIR through the close of business on November 30, 2005. Written comments should also be sent to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, Calaveras EIR, 30 Van Ness Avenue, Suite 4150, San Francisco, CA 94103, or provided by email to diana.sokolove@sfgov.org. Copies of all documents received will be transmitted to the Corps by San Francisco City staff.



PUBLIC SCOPING MEETINGS **Calaveras Dam Replacement**

To address seismic safety concerns about the existing Calaveras Dam and Reservoir in Alameda and Santa Clara Counties, the San Francisco Public Utilities Commission proposes to build a replacement dam of equal height and improved seismic design. The project also includes plans to release up to 6,300 acre-feet of water per year from the reservoir to Alameda Creek for enhancement of fisheries and other natural resources.

Environmental Review Process and Scoping Meetings

State law requires a comprehensive study of the potential environmental effects of this project. Members of the public are invited to attend the scoping meetings (see below) to provide comments on the scope and focus of the environmental review:

Fremont Monday, November 14, 6:30-8:30 PM

Fremont Main Library

2400 Stevenson Boulevard, Fukaya Room

By public transit take BART to Fremont station. Walk to the end of BART Way, turn left at Civic Center Drive and go two blocks to Stevenson.

San Francisco Tuesday, November 15, 6:30-8:30 PM

San Francisco State University

425 Market Street, Room 301

By public transit take BART to Embarcadero station. Walk two blocks to Market and Fremont Streets.

See www.sfwater.org for additional details. For information on the Calaveras Dam Replacement Project, contact Betsy Lauppe Rhodes, San Francisco Public Utilities Commission (415) 554-3240 or blauppe@sfwater.org.

For More Information on the Environmental Review

please contact Diana Sokolove, San Francisco Planning Department (415) 558-5971 or diana.sokolove@sfgov.org.

C. SCOPING MEETING MATERIALS

- Agenda
- Presentation
- Sign-in Sheets
- Speaker Cards
- Written Comments
- NOP Figures 3 and 4
- WSIP “Look Ahead Schedule”
- Calaveras Dam Replacement Fact Sheet

SFPUC Calaveras Dam Replacement Project
Case No. 2005.0161E

Public Scoping Report
Davis & Associates/ETJV

SAN FRANCISCO PLANNING DEPARTMENT

Scoping Meeting for the Environmental Impact Report on the SFPUC's Proposed Calaveras Dam Replacement Project



AGENDA

November 14, 2005

6:30 to 8:30 pm

6:30 – 6:55 pm Project Presentations

- Environmental Review Process (Diana Sokolove, SF Planning)
- Calaveras Dam Replacement Project (David Rogers, SFPUC)

6:55 – 8:25 pm Public Comment *(If you would like to make a comment, please fill out a "speaker card" and hand it to a staff member. We will call your name.)*

8:25 – 8:30 pm Closing Remarks

Acronyms

SFPUC: San Francisco Public Utilities Commission

MEA: Major Environmental Analysis Division, San Francisco Planning Department

WSIP: The SFPUC's proposed regional Water System Improvement Program

CEQA: California Environmental Quality Act

EIR: Environmental Impact Report. A detailed statement prepared under CEQA describing and analyzing the significant environmental effects of a project and discussing ways to mitigate or avoid those effects

NOP: Notice of Preparation. Notification of plans to prepare an EIR sent to Responsible and Trustee Agencies and involved federal agencies and other interested parties to solicit guidance on the scope and content of the environmental information to be included in an EIR.

MCE: Maximum Credible Earthquake

PMF: Probable Maximum Flood

About the Environmental Review Process:

Please contact Diana Sokolove at San Francisco Planning Department (415) 558-5971 or diana.sokolove@sfgov.org

About the Calaveras Dam Replacement Project:

Please contact Betsy Lauppe Rhodes, SFPUC, (415) 554-3240 or blauppe@sfgov.org

You may read the Notice of Preparation:

Available at http://www.sfgov.org/site/planning_index.asp

**For More
Information**

SAN FRANCISCO PLANNING DEPARTMENT

Scoping Meeting for the Environmental Impact Report on the SFPUC's Proposed Calaveras Dam Replacement Project



AGENDA

November 15, 2005

6:30 to 8:30 pm

6:30 – 6:55 pm Project Presentations

- Environmental Review Process (Diana Sokolove, SF Planning)
- Calaveras Dam Replacement Project (David Rogers, SFPUC)

6:55 – 8:25 pm Public Comment *(If you would like to make a comment, please fill out a "speaker card" and hand it to a staff member. We will call your name.)*

8:25 – 8:30 pm Closing Remarks

Acronyms

SFPUC: San Francisco Public Utilities Commission

MEA: Major Environmental Analysis Division, San Francisco Planning Department

WSIP: The SFPUC's proposed regional Water System Improvement Program

CEQA: California Environmental Quality Act

EIR: Environmental Impact Report. A detailed statement prepared under CEQA describing and analyzing the significant environmental effects of a project and discussing ways to mitigate or avoid those effects

NOP: Notice of Preparation. Notification of plans to prepare an EIR sent to Responsible and Trustee Agencies and involved federal agencies and other interested parties to solicit guidance on the scope and content of the environmental information to be included in an EIR.

MCE: Maximum Credible Earthquake

PMF: Probable Maximum Flood

For More Information

About the Environmental Review Process:

Please contact Diana Sokolove at San Francisco Planning Department (415) 558-5971 or diana.sokolove@sfgov.org

About the Calaveras Dam Replacement Project:

Please contact Betsy Lauppe Rhodes, SFPUC, (415) 554-3240 or blauppe@sfgov.org

You may read the Notice of Preparation:

Available at http://www.sfgov.org/site/planning_index.asp

SIGN-IN

SAN FRANCISCO PLANNING DEPARTMENT
Scoping Meeting for the
Environmental Impact Report on the SFPUC's
Proposed Calaveras Dam Replacement Project
Fremont, California – November 14, 2005



NAME	AFFILIATION	ADDRESS	PHONE or EMAIL

SIGN-IN

SAN FRANCISCO PLANNING DEPARTMENT

Scoping Meeting for the
Environmental Impact Report on the SFPUC's
Proposed Calaveras Dam Replacement Project
San Francisco, California – November 15, 2005



NAME	AFFILIATION	ADDRESS	PHONE or EMAIL



SPEAKER CARD

SAN FRANCISCO PLANNING DEPARTMENT

Scoping Meeting for the
Environmental Impact Report on the SFPUC's
Proposed Calaveras Dam Replacement Project
San Francisco, California – November 14, 2005



CONTACT INFORMATION

If you would like to speak during the public comment period, please hand this card to a staff member and your name will be called.

Name: _____

Affiliation: _____

Address: _____

City, State, Zip: _____

Phone or Email: _____



SPEAKER CARD

SAN FRANCISCO PLANNING DEPARTMENT

Scoping Meeting for the
Environmental Impact Report on the SFPUC's
Proposed Calaveras Dam Replacement Project
San Francisco, California – November 14, 2005



CONTACT INFORMATION

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Name: _____

Affiliation: _____

Address: _____

City, State, Zip: _____

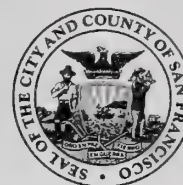
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SPEAKER CARD

SAN FRANCISCO PLANNING DEPARTMENT

Scoping Meeting for the
Environmental Impact Report on the SFPUC's
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San Francisco, California – November 15, 2005



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Name: _____

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Phone or Email: _____



SPEAKER CARD

SAN FRANCISCO PLANNING DEPARTMENT

Scoping Meeting for the
Environmental Impact Report on the SFPUC's
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San Francisco, California – November 15, 2005



CONTACT INFORMATION

If you would like to speak during the public comment period, please hand this card to a staff member and your name will be called.

Name: _____

Affiliation: _____

Address: _____

City, State, Zip: _____

Phone or Email: _____

San Francisco Planning Department
Environmental Impact Report on the SFPUC's
Proposed Calaveras Dam Replacement Project



1. Leave your comment sheet in designated "Comment Box" tonight;
2. Mail your comments by November 30, 2005 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, Calaveras Dam Replacement Project EIR, 30 Van Ness Avenue, Suite 4150, San Francisco, CA 94102; or
3. E-mail written comments by November 30, 2005 to diana.sokolove@sfgov.org.

Name: _____

Affiliation: _____

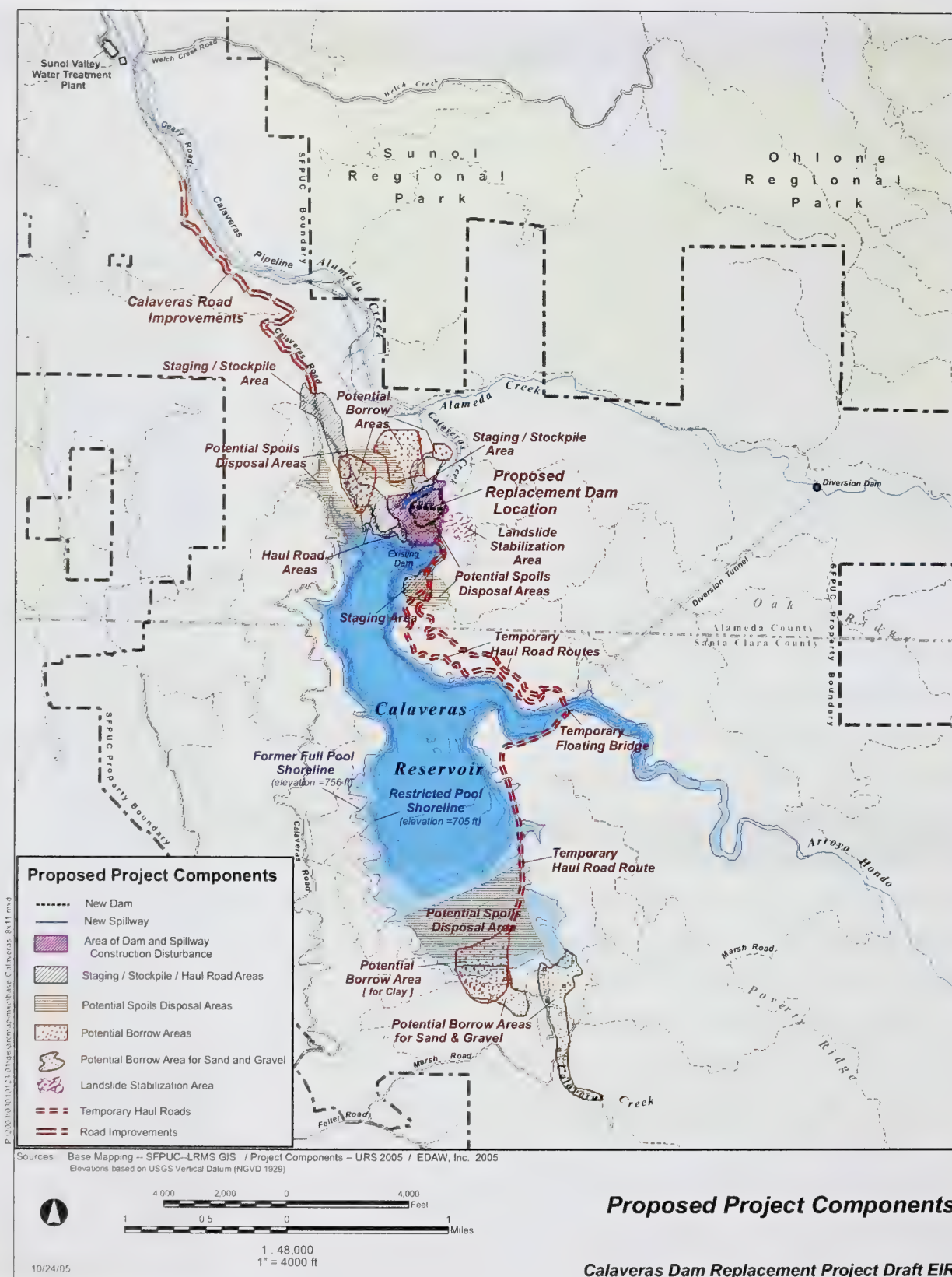
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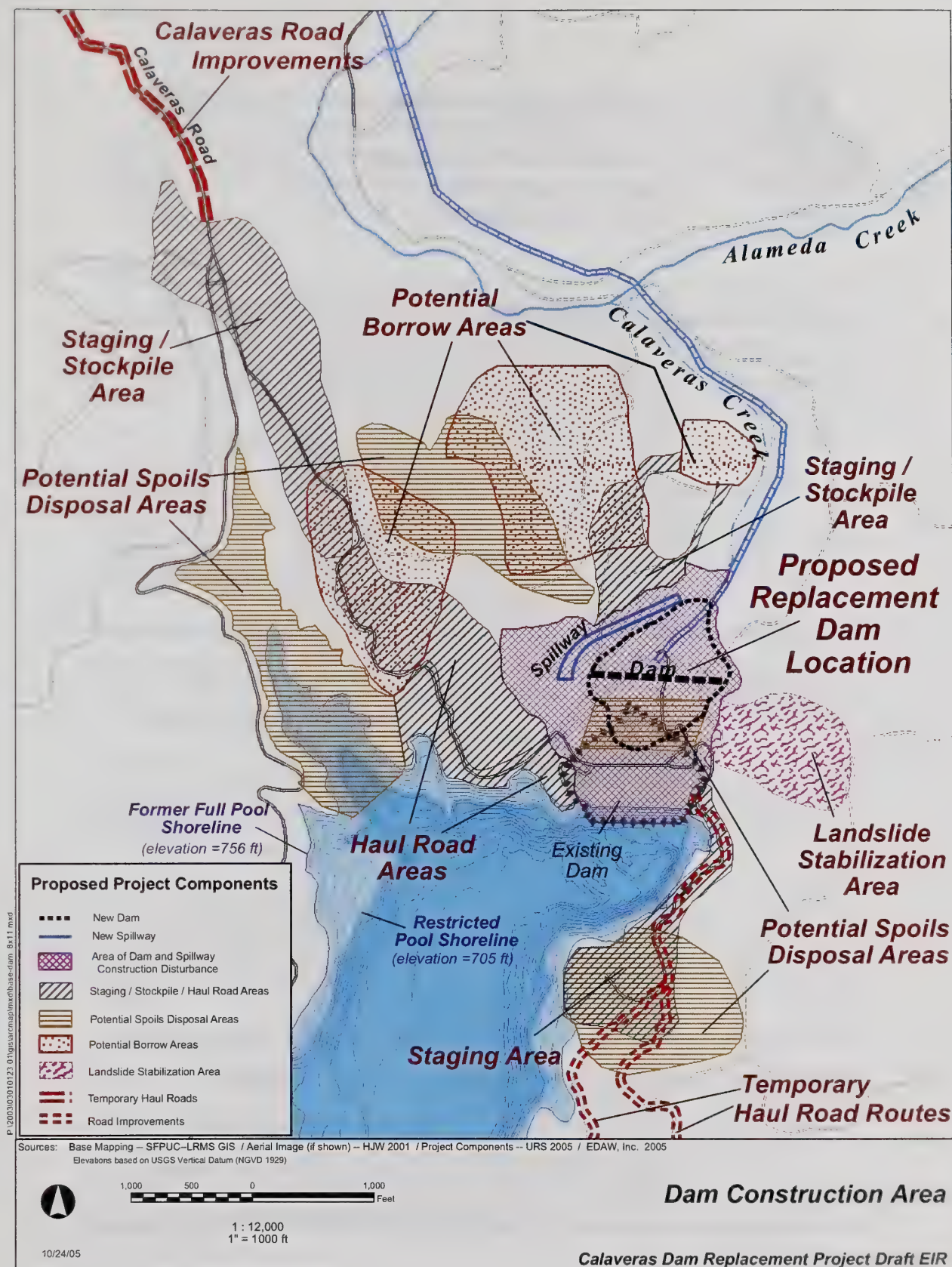
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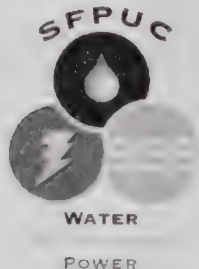






**Water System Improvement Program
and Other SFPUC Projects
Individual Environmental Review
Look Ahead Schedule
November 8, 2005**

PROJECT	STATUS	UPCOMING MEETINGS
Calaveras Dam Replacement Project	Public comment period set for October 24 - November 30, 2005	SCOPING MEETINGS November 14, 2005, Fremont Fremont Main Library, Fukaya Room 2400 Stevenson Blvd 6:30 to 8:30 pm November 15, 2005, San Francisco San Francisco State University 425 market St. Room 301 6:30 to 8:30 pm
Niles/Sunol Dam Removal Project	Draft Environmental Impact Report released for public comment on October 24, 2005. Public comment period ends at 5:00 p.m. on December 7, 2005. Copies of the draft EIR and information on how to provide comment can be found on sfwater.org , projects+ plans and at www.sfgov.org/planning .	PUBLIC COMMENT ON DRAFT EIR November 30, 2005, Fremont Fremont Main Library, Fukaya Room 2400 Stevenson Blvd 6:30 to 8:30 pm December 1, 2005, San Francisco Hearing on the Draft EIR San Francisco Planning Commission Meeting in Room 400, City Hall, 1 Dr. Carlton B. Goodlett Place, 1:30 p.m.
Alameda Habitat Conservation Plan	Work on covered species and covered activities continues. Draft impact analysis is expected to be completed by Spring of 2006.	PUBLIC MEETINGS Tentative November 2005 Informal meeting on roads and trails. For more info contact Joanne Wilson, jwilson@sfwater.org.



**Water System Improvement Program
and Other SFPUC Projects
Individual Environmental Review
Look Ahead Schedule
November 8, 2005**

Alameda Habitat Conservation Plan (continued)		Tentative March 2006 Public meeting on impact analysis of HCP.
New Crystal Springs Bypass Tunnel	Environmental Review has begun.	PUBLIC OUTREACH MEETING Anticipated in early 2006.
Lower Crystal Springs Dam Improvements	Environmental Review has begun.	SCOPING MEETINGS Anticipated Spring 2006
Bay Division Pipeline Reliability Upgrade	Conceptual Engineering Report Completed. Environmental Review is underway.	SCOPING MEETINGS Anticipated early 2006.
New Irvington Tunnel Project	Conceptual Engineering Report completed. Environmental review starting.	SCOPING MEETINGS Anticipated Spring 2006.
East/West Transmission Line Project	Design is 95% complete. Team requested Categorical Exemption from MEA. Construction Scheduled to begin in June of 2006	PUBLIC OUTREACH MEETINGS Anticipated May/ June 2006.
Crystal Springs/ San Andreas Transmission Upgrade	Environmental Review is beginning.	PUBLIC OUTREACH MEETING Anticipated scheduled for late 2006.

Project Background

Important Source of Drinking Water

The San Francisco Public Utilities Commission (SFPUC) provides water to 2.4 million people in Alameda, Santa Clara, San Mateo, and San Francisco counties, either directly or indirectly through our 28 regional wholesale customers. Water from the SFPUC system originates from two primary sources: Upper Tuolumne River Watershed in the Sierra Nevada Mountains and local surface water from the Alameda and Peninsula Watersheds. Although the local water supplies provide approximately 15% of the system's water, this water is crucial to the water supply reliability of the water system.

Calaveras Dam and Reservoir

Located in the Alameda Watershed near Fremont, California, Calaveras Reservoir is the system's largest local reservoir, providing up to 96,850 acre-feet of storage or 31 billion gallons of water collected from creeks within the watershed. Calaveras Reservoir, when full, represents nearly 40% of all storage capacity in the SFPUC local water system.

Calaveras Dam was originally constructed primarily of hydraulic fill in the early 1920's. However, subsequent studies question the seismic reliability of hydraulic fill dams in seismically active areas. In 2001, the SFPUC initiated a study of the seismic safety of Calaveras Dam, given the increasing industry-wide concerns about the fitness of hydraulic filled dams and the dam's proximity to Calaveras Fault. In Winter 2001, in response to safety concerns about the seismic stability of the dam and mandates from the California Division of Safety of Dams (DSOD), the SFPUC lowered water levels in Calaveras Reservoir to approximately 40% of its normal maximum capacity. Given the importance of Calaveras Dam and Reservoir to the SFPUC local water system, it is a high priority to build a replacement dam and to restore the reservoir historical water levels.

Proposed Project

The San Francisco Public Utilities Commission (SFPUC) proposes to replace the existing dam with one of equivalent height and improved seismic design at the downstream edge of the existing dam. The project would include a new outlet tower, as required for seismic safety. The project, when completed, would allow improved operations and maintenance, as well as releases of up to 6,300 acre-feet per year of water for the enhancement of fisheries and the other natural resources of Calaveras and Alameda Creeks. The Calaveras Dam Replacement Project, as proposed, would have a reservoir storage level of 96,850 acre-feet, bringing the reservoir back to its original level before 2001. The project also includes dam design components to accommodate future enlargement. (Note enlargement is not proposed and expanding the dam in the future would be subject to a separate environmental review process under CEQA.) Construction of the proposed project is expected to begin in 2009, with completion anticipated in 2011.

Calaveras Road

Construction vehicles primarily would use Calaveras Road for entering and exiting the site, and as a hauling route for materials used during construction of the dam. Due to safety considerations, the section of Calaveras Road between Geary Road and Felter Road would be closed to the public during construction activities. However the road would remain open to emergency vehicles.

Environmental Review

The San Francisco Planning Department's Major Environmental Analysis (MEA) Division is conducting the environmental review of the project in accordance with CEQA. CEQA requires that the decision-making agency and the public be informed about the significant environmental effects of a project and ways to avoid or reduce those effects before a project is approved. Additional environmental review activities will be conducted by the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, National Marine Fisheries Service, California Department of Fish and Game, San Francisco Bay Regional Water Quality Control Board, and other regulatory agencies.

Potential Environmental Effects

The existing Calaveras Dam and Reservoir are located in a remote area within SFPUC-owned property of the Alameda Watershed. The EIR will evaluate the effects to the surrounding area from construction, construction-related activities, and operation and maintenance of the reservoir at 96,850 acre-feet. Potential environmental effects of the proposed project could include, but are not limited to effects on:

- Traffic along Calaveras Road;
- Air quality and noise levels in the surrounding areas;
- Cultural resources in construction areas;
- Water quality from increased sedimentation in surrounding creeks; and
- Flora and fauna in the area, including Alameda Creek fisheries.

About the SFPUC

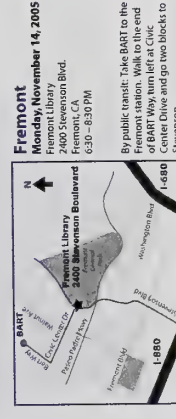
The San Francisco Public Utilities Commission (SFPUC) is a department of the City and County of San Francisco that delivers drinking water to 2.4 million people in Alameda, Santa Clara, San Mateo, and San Francisco counties. The SFPUC system generates hydropower for San Francisco municipal uses such as city buildings, MUNI, and the San Francisco International Airport. SFPUC also treats the wastewater for the City of San Francisco. For more information on the SFPUC, visit us on line at sfwater.org.

Water System Improvements

The Calaveras Dam Replacement Project is part of the \$4.3 billion bond-funded Water System Improvement Program (WSIP) to repair, replace and seismically upgrade the Hetch Hetchy System's aging pipelines, tunnels, reservoirs and dams. The projects of the WSIP will improve the SFPUC's readiness to meet water demand during seismic events, prolonged droughts and changing water quality regulations.

Public Scoping Meetings

We will hold the following scoping meetings to get input on the scope and content of the environmental review. Please join us!



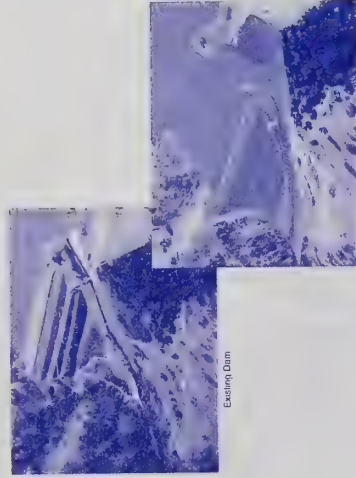
Fremont
Monday, November 14, 2005
Fremont Library
2400 Montecito Boulevard
Fremont, CA
6:30 – 8:30 PM

By public transit: Take BART to the Fremont station. Walk to the end of BART. Turn left at Civic Center Drive and go two blocks to Fremont Library.



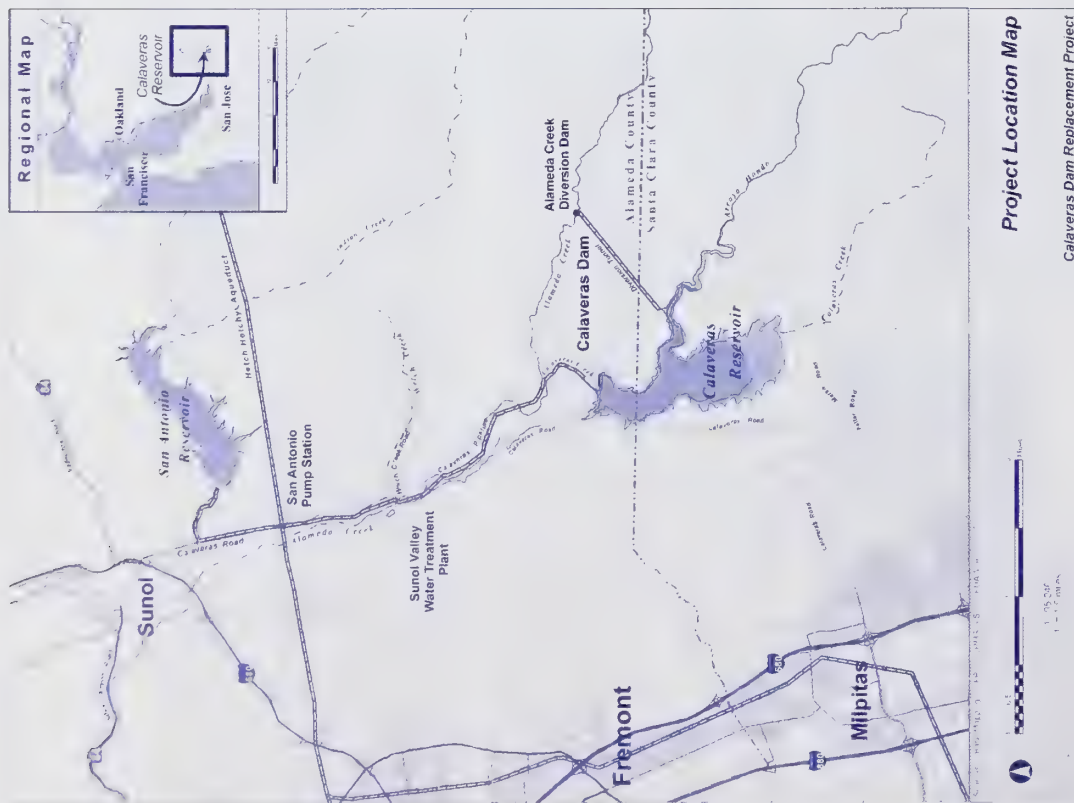
San Francisco
Tuesday, November 15, 2005
San Francisco State University
(Downtown Campus)
425 Market Street, Room 301
San Francisco, CA
6:30 – 8:30 PM

By public transit: Take BART to the Embarcadero Station and walk two blocks to Market and Fremont Streets.



View of Proposed Calaveras Dam Replacement

URS Corporation. 2005. "Calaveras Dam Conceptual Engineering, Draft Conceptual Engineering Report (Task 14). Volume I – Dam and Appurtenant Structures." Prepared for the SFPUC. April 25



Calaveras Dam Replacement Project



San Francisco Public Utilities Commission
1155 Market Street, 11th Floor
San Francisco, CA 94103

First Class Mail
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PERMIT No. 925

**For more information
or project documents,
visit www.sfwater.org**

**Questions about the Environmental
Review Process?**
Diana Sokolove
San Francisco Department of Planning
415-558-5971
diana.sokolove@sfgov.org

**Questions about Calaveras Dam
Replacement Project?**
Betsy Lauppe Rhodes
SFPU
415-554-3240
blauppe@sfgov.org



Calaveras Dam Replacement FACT SHEET

San Francisco Public Utilities Commission

The purpose of this fact sheet is to provide the background and history of the San Francisco Public Utilities Commission's (SFPU) Calaveras Dam Replacement Project and provide information on how the public can participate in the project-specific environmental review process under the California Environmental Quality Act (CEQA). The Major Environmental Analysis Division (MEA) of the San Francisco Planning Department recently started the program-level environmental review of the entire Water System Improvement Program. However this fact sheet discusses the project-specific environmental review for the Calaveras Dam Replacement Project, which has just gotten underway.

The **public scoping meetings** for the Calaveras Dam Replacement Project Environmental Impact Report (EIR) will be held on Monday, **November 14, 2005**, at the Fremont Main Library, Fukaya Room, 2400 Stevenson Blvd. Fremont, from 6:30 to 8:30 pm and Tuesday, **November 15, 2005**, San Francisco State University, 425 Market St., Room 301, San Francisco, from 6:30 to 8:30 pm. This is the opportunity for the public to provide comment on the scope and focus of the Calaveras Dam Replacement Project EIR. Learn more inside.

D. CALAVERAS AND WSIP SCOPING COMMENT LETTERS

- Letter 1: Alameda County Flood Control and Water Conservation District – Mary Lim, Environmental Services Program Manager
- Letter 2: Alameda County Water District – Paul Piraino, General Manager
- Letter 3: Alameda Creek Alliance – Jeff Miller, Director
- Letter 4: Alameda Creek Alliance – Jeff Miller, Director
- Letter 5: Alameda Creek Alliance – Jeff Miller, Director
- Letter 6: Laura Allen, East Bay Conservation Corps Charter School
- Letter 7: Bay Area Water Supply & Conservation Agency – Arthur R. Jensen, General Manager
- Letter 8: Truman L. Burns, Lafayette
- Letter 9: California Department of Fish and Game – Scott Wilson, for Robert W. Floerke, Regional Manager Central Coast Region;
- Letter 10: John G. H. Cant, Fremont
- Letter 11: City of Fremont, Planning Department – Barbara Meerjans, Senior Planner
- Letter 12: Eleanor Dunn, Volunteer/Member, Friends of Sausal Creek
- Letter 13: East Bay Regional Park District – Brad Olson, Environmental Programs Manager
- Letter 14: David K. Garges, Union City
- Letter 15: Sherman Lewis, Chair, Hayward Area Planning Association
- Letter 16: Caryle Holmes, Nevada City
- Letter 17: Kevin Laird, Fremont
- Letter 18: National Marine Fisheries Service – Dick Butler and Gary Stern
- Letter 19: Kristin Ohlson, Oakland
- Letter 20: Jim, Diana, and Ken Prola - San Leandro
- Letter 21: Todd M. Ravazza, Dublin
- Letter 22: Restore Hetch Hetchy – Ron Good, Executive Director
- Letter 23: San Francisco Architectural Heritage – Charles Edwin Chase, Executive Director
- Letter 24: Santa Clara Valley Water District – Amy Fowler, Special Programs Engineer
- Letter 25: Sierra Club – John Rizzo, Chair, San Francisco Bay Chapter

SFPUC Calaveras Dam Replacement Project
Case No. 2005.0161E

Public Scoping Report
Davis & Associates/ETJV

- Letter 26: Kenneth G. Snetsinger and Judith C. Etheridge, Sunol
- Letter 27: Scott Stevenson, San Jose
- Letter 28: The Nature Conservancy – Daniel Olstein, Mount Hamilton Project Manager

Letters Received on the WSIP Scoping Process

- Letter 29: Alameda Creek Alliance – Jeff Miller, Director
- Letter 30: East Bay Regional Park District – Brad Olson, Environmental Programs Manager
- Letter 31: Sierra Club – Dan Sullivan, California Water Committee Chair; John Rizzo, Chair, San Francisco Bay Chapter; Richard Zimmerman, Loma Prieta Chapter Water Committee Chair
- Letter 32: Stanford Legal Clinics on behalf of The Tuolumne River Trust – Holly Gordon, Stephen Lindholm, Justin Pidot
- Letter 33: State Water Resources Control Board – Katherine Mrowka, Chief, Watershed Unit 3

12/06/2005 18:07 4152741820

Letter No. 1

**ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT**

100 NORTH CANYONS PARKWAY, LIVERMORE, CA 94551

PHONE (925) 454-5000

November 18, 2005

Mr. Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
30 Van Ness Avenue, Suite 4150
San Francisco, CA 94103

Re: SFPUC Calaveras Dam Replacement Project Notice of Preparation of an Environmental Impact Report

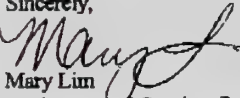
Dear Mr. Maltzer:

Zone 7 has reviewed the referenced CEQA document in the context of Zone 7's mission to provide drinking water, non-potable water for agriculture and irrigated turf, flood protection, and groundwater and stream management within the Livermore-Amador Valley.

This project is located in unincorporated portion of Alameda and Santa Clara Counties and proposes replace the existing Calaveras Dam in order to restore it to full design level and allow for releases of up to 6,300 acre-feet per year for fishery enhancement. This project site is outside of the Livermore-Amador groundwater basin and is located in a portion of the Alameda Creek Watershed that is owned by the San Francisco Public Utilities Commission. Based upon our review, your project is not expected to impact our facilities.

We appreciate the opportunity to comment on this document. If you have any questions or comments, please feel free to contact me at (925) 454-5036 at your earliest convenience.

Sincerely,


Mary Lim
Environmental Services Program Manager

cc: Karla Nemeth, Environmental & Public Affairs Manager, Zone 7
David Houts, Staff Analyst, Zone 7



Letter No. 2

DIRECTORS
 MARTIN L. KOLLER
 President
 JUDY C. HUANG
 Vice President
 JAMES G. GUNTHER
 ARTHUR LAMPERT
 JOHN H. WEED

43885 SOUTH GRIMMER BOULEVARD • P.O. BOX 5110, FREMONT, CALIFORNIA 94537-5110
 (510) 668-4200 • FAX (510) 770-1793 • www.acwd.org

MANAGEMENT
 PAUL PIRAINO
 General Manager
 ROBERT SHAVER
 Engineering Manager
 KARL B. STINSON
 Operations Manager
 WILLIAM J. ZENONI
 Finance and Administration Manager

November 30, 2005

Mr. Paul Maltzer, Environmental Review Officer
 Calaveras Dam Replacement Project EIR
 San Francisco Planning Department
 30 Van Ness Avenue, Suite 4150
 San Francisco, CA 94102

Dear Mr. Maltzer:

Subject: ACWD Comments for the SFPUC Calaveras Dam Replacement Project EIR Scope

Alameda County Water District (ACWD) is pleased to have the opportunity to comment on the scope and focus of issues to be addressed in the Environmental Impact Report for the Calaveras Dam Replacement Project. ACWD is a water retailer that provides potable water to a population of over 322,000 in the Cities of Fremont, Newark and Union City. Although variable depending on hydrologic conditions, ACWD relies on the Alameda Creek Watershed to provide more than 30,000 acre-feet per year of local and imported water for groundwater replenishment. This water recharges the Niles Cone Groundwater Basin (downstream of the Niles Canyon) through percolation both in Alameda Creek and adjacent percolation ponds. This water is subsequently recovered through ACWD's groundwater production wells and distributed as a potable water supply to the District's customers. In addition, ACWD is also a wholesale customer of the SFPUC, and receives approximately 30% of our total supply from the Hetch-Hetchy system.

Because of the importance of Alameda Creek to ACWD's water supplies, ACWD has a strong interest in protecting and preserving the quantity and quality of water in Alameda Creek watershed. The SFPUC policies and programs as they relate to watershed issues in the Alameda Creek watershed are of special interest to ACWD. As you may know, ACWD has maintained a long term commitment to watershed protection and to assuring the health and safety of water supplies on which our customers depend.

Based on our review of the Notice of Preparation we have the following comments:

- Any negative impacts to Alameda Creek water quality and quantity during construction of Calaveras Dam need to be addressed and mitigated. This includes any increases in water turbidity that would impact the ability of ACWD to use Alameda Creek flows for groundwater recharge.

Mr. Paul Maltzer
Page 2
November 30, 2005

In addition, SFPUC should identify and implement Best Management Practices (BMPs) to prevent any discharges and/or spills that would degrade water quality in Alameda Creek.

- Any negative impacts to Alameda Creek water supply as a result of operation of Calaveras Dam and /or the Alameda Creek Diversion Dam need to be addressed and mitigated.
- An alert system using best available technology needs to be implemented by the SFPUC before project construction and continuously maintained by the SFPUC for as long as Calaveras Dam exists. This alert system must be able to give advance notification to all entities located downstream of the Calaveras Reservoir of the time, rate, and quality of flow of all water releases from Calaveras Reservoir into Alameda Creek. Such water releases would include overspill, regulated flows, emergency releases, maintenance & operational releases.

If you have any questions regarding this letter, please contact Jim Reynolds at 510.668.6511.
Thank you again for the opportunity to comment on the Calaveras Dam Replacement Project.

Sincerely,

A handwritten signature in blue ink, appearing to read "Paul Piraino for".

Paul Piraino
General Manager

jrr

Alameda Creek Alliance

PO Box 192 • Canyon, CA • 94516

(510) 499-9185

e-mail: alamedacreek@hotmail.comweb site: <http://www.alamedacreek.org>**Letter No. 3**

November 8, 2005

San Francisco Planning Department
Attention: Paul Maltzer
Environmental Review Officer, Calaveras EIR
30 Van Ness Avenue, Suite 4150
San Francisco, CA 94103

Re: Scoping Comments on Calaveras Dam Replacement Project

These are the comments of the Alameda Creek Alliance (ACA) on the SFPUC's proposed Calaveras Dam Replacement Project (Project). The ACA is a community watershed group dedicated to the protection and restoration of the natural ecosystems of the Alameda Creek watershed. The ACA has over 730 members that live in the watershed and has been advocating for restoration of steelhead trout since 1997.

The ACA supports the SFPUC's efforts to make needed repairs and earthquake safety retrofits to its water system. However, given that the Calaveras Dam Replacement Project is a major infrastructure project with significant environmental impacts, the ACA can only support this project if specific environmental benefits and adequate mitigations are provided as part of the project. The ACA proposes that the following elements be included in the Project:

- avoidance of impacts to listed species and their habitat, and full and meaningful mitigations if such impacts cannot be avoided;
- anadromous fish passage (including upstream migration of adult steelhead and out-migration of steelhead smolts) at Calaveras Dam and Alameda Diversion Dam;
- sufficient stream flows to meet the SFPUC's legal responsibilities to keep native fish and wildlife in Alameda Creek in good condition, and for spawning, rearing and out-migration of steelhead trout;
- restored ecosystem function below Calaveras Dam and the Alameda Diversion Dam;
- abandon construction of the proposed rubber dam and recapture facility in Sunol Valley; and
- reservoir infrastructure and operations to protect the trout population in Calaveras Reservoir.

Alternatives Analysis

The EIR for the Project must evaluate a reasonable range of project elements or alternatives for avoidance of impacts to listed species and their habitat, for providing anadromous fish passage, for releasing water from SFPUC dams, for restoring ecosystem function, and for protecting reservoir trout, including the project elements and alternatives raised in this letter.

Project Description

A major failing of the proposed Project is the description of the purpose of and need for the Project. Stewardship and restoration actions need to be included in the Project and the project description. The Project should acknowledge the SFPUC's stewardship obligations, legal requirements for environmental protection, and the public's desire for restoration actions. The Project should also include and fully describe adequate mitigations for both the physical footprint impacts and the ongoing operational impacts of the proposed project. Replacement and operation of Calaveras Dam (including operation of the Alameda Diversion Dam) is a major infrastructure project that will have significant and ongoing environmental impacts in the Alameda Creek watershed.

Measures A and E, the legislation authorizing the financing for the SFPUC's Water System Improvement Program (WSIP), were approved by San Francisco voters in November of 2002. These measures made it clear that stewardship and environmental restoration were to be part of WSIP projects, such as the Calaveras Dam Replacement Project. Proposition E states; "in planning for its future needs and those of its wholesale customers, the City must promote water conservation and responsible stewardship of its natural resources." Proposition A states that WSIP improvements; "include, but are not limited to, water delivery and seismic improvements, water quality improvements, water supply improvements, and watershed and environmental improvements." The recent Parsons/CH2MHill report to the SFPUC concluded that "activities reflecting the SFPUC's commitment to integrate the Stewardship Policy and Principles into the WSIP have not been made explicit" and have "not been fully applied to the program." The Parsons/CH2MHill report recommended ensuring that the watershed stewardship policy is applied consistently to the program and to project-specific scopes.

Thus, part of the stated purpose and description of the Calaveras Dam Replacement Project should be to keep native fish populations, including those downstream of Calaveras Dam, downstream of the Alameda Diversion Dam, and in Calaveras Reservoir, in good condition; to restore lost habitat for anadromous steelhead trout in Alameda Creek; and to restore ecosystem function below SFPUC diversions.

Mitigation and Restoration Elements

When deciding on mitigation and restoration elements for the Project, the SFPUC must keep in mind the following factors, which should be discussed in the EIR for the Project:

The proposed Project is not just replacement of a dam, but also operation of that dam. Operation of Calaveras Dam is going to have significant environmental consequences, including continuing to block access for ocean-run fish to the best steelhead spawning and rearing habitat in the watershed, impounding stream flows, and blocking essential physical processes such as sediment transport, channel scouring, and woody debris recruitment.

The operation of Calaveras Dam includes the operation of the Alameda Diversion Dam (ADD), which diverts water for storage in Calaveras Reservoir. Thus the Project must include mitigation and restoration elements for the ADD.

The proposed Project will have environmental impacts beyond the physical footprint of the dam, the reservoir, access roads, and borrow, spoils and staging areas. Mitigations for the Project should include mitigations for impacts to these physical areas, as well as mitigations for impacts to Alameda and Calaveras Creeks downstream of the dams.

The operation of the existing Calaveras Dam and the ADD has for decades violated California Fish and Game Code §5937, which requires dam owners to release enough water to keep downstream fish populations in good condition. The SFPUC impounds or diverts natural stream flow behind these dams without minimum flow releases to benefit fish and wildlife habitat or native vegetation downstream of the dams. The operations of these dams contributed to the past extirpation of anadromous fish, and current operations leave inadequate flow in Alameda Creek below the dams to maintain resident trout populations in good condition. Fully 86% of the stream flow in the watershed area tributary to Alameda Creek in the Sunol Valley is diverted by the SFPUC for water supply, reducing available habitat and harming native fish populations. The operation of the replacement Calaveras Dam and the ADD, even with the proposed flow releases contemplated in the Notice of Preparation (NOP) for the Project, will likely continue to violate §5937 and may also result in unauthorized take of listed steelhead and rainbow trout, as discussed below.

The SFPUC at one point notified the Alameda Creek Fisheries Restoration Workgroup that the removal of Niles and Sunol Dams from Alameda Creek in Niles Canyon may be used as mitigation for the Calaveras Dam Replacement Project. While these dam removals will clearly benefit anadromous fish migration, Niles and Sunol Dams are being removed by the SFPUC primarily due to public safety and liability concerns and to avoid “take” liability under the Endangered Species Act, as these dams are potential barriers to migrating steelhead trout. The removal of Niles and Sunol Dams is in no way mitigation for the environmental impacts of the proposed replacement and operation of Calaveras Dam.

Impacts of the Proposed Project

The NOP for the Project noted the potential for habitat loss and disturbance for a number of special status species and sensitive habitat types found around Calaveras Reservoir. The Berkeley kangaroo rat (*Dipodomys heermanni berkeleyensis*), which has recently been re-discovered by the East Bay Regional Park District on ridges east of Calaveras Reservoir,¹ should be added to this list. The NOP noted the potential listing of the trout population in the Calaveras Reservoir watershed. Due to potential impacts to habitat downstream of SFPUC dams as a result of the Project, existing rainbow trout and future steelhead trout populations in Alameda Creek below Calaveras Dam and the ADD should also be included.

Prior to the EIR, the SFPUC should conduct surveys to determine if any listed, rare, or unusual plants will be affected by the Project. Surveys should follow the California Native Plant Society (CNPS) *Botanical Survey Guidelines*. The East Bay Chapter of the CNPS should be contacted to determine if there are any special status plant species that are known to occur or potentially occur in the Project area for which impacts should be evaluated and the species protected under CEQA. The SFPUC should contact Dianne Lake, the Unusual Plants Coordinator for the East Bay Chapter of the CNPS, at (510) 741-8066 or diannelake@yahoo.com.

The EIR for the Project must evaluate all of the environmental impacts that may result downstream of the project due to the rebuilding of Calaveras Dam. As discussed below, these impacts include impeding fish migration, preventing gene flow between trout populations, impounding stream flows, disrupting ecosystem function, and reducing habitat quality below these dams.

¹ J. DiDonato, EBRPD, pers. comm., 2005.

Avoid Impacts to Listed Species

The NOP notes that the Project has the potential to impact sensitive habitat types, including sycamore alluvial woodland, callippe silverspot butterfly habitat, and bay checkerspot butterfly habitat, and impact special status species, including rainbow trout, Sacramento perch, Pacific lamprey, California red-legged frog, foothill yellow-legged frog, California tiger salamander, Alameda whipsnake, most beautiful jewel flower, Cooper's hawk, Townsend's western big-eared bat, golden eagle, great blue heron, sharp-shinned hawk, and western pond turtle. The Berkeley kangaroo rat should be added to this list. For the environmental review for the Project, the SFPUC should conduct protocol-level species and habitat surveys for all of these listed species and sensitive habitats, within the reasonable vicinity of the Project area. The results of these surveys and maps clearly showing the locations of habitats and species should be published as part of the draft EIR for the Project.

All infrastructure and the direct footprint of the proposed Project should avoid impacts to these species and habitats. All haul roads and areas used for borrow, spoils disposal, stockpile or staging should avoid habitat for and impacts to these species. If any haul roads, construction areas or any other temporary or permanent infrastructure for the Project must be located such that they directly affect these habitats or species, the environmental review for the Project should identify these areas and specify why the habitat cannot be avoided, including an analysis of alternative locations. If such impacts cannot be avoided, the Project must include full and biologically meaningful mitigations for the affected habitat or species. The potential indirect impacts to these species and habitat types due to traffic, noise, lights, dust and human disturbance generated by the Project must be evaluated during the EIR.

Fish Passage at Calaveras Dam

The operation of Calaveras Dam without fish passage violates California Fish and Game Code §5901, which makes it illegal to maintain any device which prevents or impedes the passing of fish up and down stream. The construction of Calaveras Dam and Reservoir blocked the upstream and downstream movements of both resident and transient fishes, including steelhead trout.² The Calaveras watershed trout population appears to be descended from native steelhead populations isolated behind the dam.³ Calaveras Dam blocks steelhead access to the upper Calaveras watershed including its tributaries Arroyo Hondo, Smith, and Isabel Creeks, likely the best historical steelhead spawning and rearing habitat in the entire Alameda Creek watershed. Calaveras Dam prevents gene flow between trout populations above and below the reservoir, and may be affecting the long-term genetic viability of reservoir and stream populations.

The Calaveras Dam Replacement Project should include infrastructure and provisions for fish passage around the new dam, both in-migration of adult ocean-run steelhead and out-migration of juvenile steelhead smolts and fry. The fish passage element of the Project should ensure that once fish passage projects in lower Alameda Creek are completed or when steelhead are moved upstream under permit, future adult ocean run steelhead trout from San Francisco Bay are able to bypass the rebuilt Calaveras Dam to reach spawning and rearing habitat in lower Arroyo Hondo. The Project should also ensure that juvenile steelhead reared in Arroyo Hondo can out-migrate

² San Francisco Public Utilities Commission (SFPUC). 2005. Population Size Estimates for Adult Rainbow Trout (*Oncorhynchus mykiss*) in San Antonio and Calaveras Reservoirs. Technical Memorandum No. 2-04-006, October 2005. Water Quality Bureau, Sunol, CA.

³ Gunther, A. J. et al. 2000. An Assessment of the Potential for Restoring a Viable Steelhead Trout Population in the Alameda Creek Watershed. Prepared for the Alameda Creek Fisheries Restoration Workgroup.

Nielsen, J. L. 2003. Population Genetic Structure of Alameda Creek Rainbow/Steelhead Trout - 2002. Final Report Submitted to Hagar Environmental Science December 4, 2003. US Geological Survey, Alaska Science Center, Anchorage, Alaska.

downstream past Calaveras Dam to Alameda Creek or the San Francisco Bay. Lack of successful out-migration is a major limiting factor for steelhead populations on other California rivers. The chances of restoring a viable steelhead population to the Alameda Creek watershed will be substantially greater if the habitat and trout population in Arroyo Hondo is connected with the Bay. This connectivity and opportunity for ocean-run fish and Calaveras fish to mix will provide genetic variability for both the reservoir population and Alameda Creek steelhead populations.

The ACA proposes several options for providing fish passage at Calaveras Dam, including:

- constructing a bypass canal around the dam;
- constructing a fish ladder at the dam; or
- trapping fish above and below the dam and transporting them around the dam.

A bypass canal connecting Arroyo Hondo with Calaveras Creek or Alameda Creek below the dam may be the preferred option given the height of the dam and the difficulty for fish to negotiate the slack water habitat of the reservoir. A bypass canal could allow in-migrating adult steelhead to reach spawning habitat in lower Arroyo Hondo and allow steelhead smolts and fry to move downstream into Alameda Creek or continue downstream to the San Francisco Bay. Migratory flows in the bypass canal could meet any downstream flow requirement for Calaveras Dam. Construction of the canal could be accomplished while earth is being moved for temporary haul roads, borrow pits, and spoils areas around the reservoir.

A fish ladder at Calaveras Dam could provide for fish passage and carry flow releases, but may be less desirable due to the height of the dam, the constriction of the Calaveras Creek gorge below the dam, and the slack water pool in the reservoir. Juvenile steelhead would have to negotiate through Calaveras Reservoir to find the upstream entrance of the fish ladder. Trapping fish and hauling them around the dam would be the least desirable solution, as it would require more intensive intervention, management and monitoring, as well as construction of facilities to collect fish for both upstream and downstream migrations.

As an additional Project element, to improve steelhead smolt migration, the SFPUC should conduct annual summer fish rescue operations in tributaries to both Calaveras and San Antonio Reservoirs. Juvenile steelhead trout are trapped and perish each summer as isolated pools in these tributaries dry up. Juvenile fish could be easily and inexpensively rescued from these tributaries and moved downstream to suitable rearing habitat in Alameda Creek below the dam, furthering the restoration of a steelhead population below the dams.

The EIR for the Project should evaluate all of these and any other feasible fish passage options.

Fish Passage at Alameda Diversion Dam

The operation of the ADD is a part of the proposed Project, as the ADD is and will be used to divert Alameda Creek stream flow for storage in Calaveras Reservoir. The EIR for the Project must discuss the operation of the ADD. The operation of the ADD without fish passage violates California Fish and Game Code §5901, which makes it illegal to maintain any device which prevents or impedes the passing of fish up and down stream. The ADD blocks the upstream and downstream movements of both resident and transient fishes, including resident rainbow trout. Once fish passage projects in lower Alameda Creek are completed or when steelhead are moved upstream under permit, the ADD will block upstream and downstream migration of steelhead trout.

Operation of the ADD not only affects fish migration past the ADD, but also through Little Yosemite, by diverting the majority of the annual flow of upper Alameda Creek. Reducing the frequency of high flow periods downstream of the ADD reduces fish passage opportunities through Little Yosemite.⁴ Operation of the ADD also influences instream flow, aquatic habitat suitability, and sediment transport in Alameda Creek below the dam. Operation of the ADD affects resident trout below the dam currently proposed for federal listing.

Two options for providing fish passage at the ADD include either complete removal of the dam or building a fish ladder at the dam, installing a fish screen at the diversion, and providing bypass flows for fish migration. The ACA recommends complete removal of the ADD as the preferred alternative, since there would be no maintenance or operation required in the future and complete removal would allow for restoration of a natural stream channel. The ACA believes the SFPUC does not have a valid water right to legally divert of the majority of upper Alameda Creek stream flow at the ADD. Recently, 68 Bay Area conservation organizations representing tens of thousands of Bay Area residents sent the SFPUC a letter calling for the removal of the ADD. Constructing a fish ladder and installing fish screens would provide fish passage, but may cost as much as removal of the dam, and would require ongoing operational, monitoring and maintenance costs, and would add more artificial channel and infrastructure to a relatively pristine section of the creek. The EIR for the Project should evaluate these and any other feasible fish passage options.

Instream Flows

Since 1997, the ACA has been requesting that the SFPUC release sufficient stream flow from SFPUC dams to keep native fish downstream in good condition and to allow spawning, rearing, and out-migration of steelhead trout. Recently, 68 Bay Area conservation organizations representing tens of thousands of Bay Area residents sent the SFPUC a letter requesting these flows. Minimum flow releases would also benefit riparian vegetation and periodic scouring flows from Calaveras Reservoir would help prepare spawning gravels downstream and reduce summer algal blooms and overgrowth by cattails. Enhanced stream flows would provide additional deep-water habitat in upper Alameda Creek, identified by the SFPUC as a factor limiting trout restoration. Populations of native resident rainbow trout below the dams, in Alameda Creek and its tributaries in the upper Sunol Valley, are very small, with few to no trout found in most reaches in dry years.⁵ These populations are severely constrained by lack of rearing habitat and high summer temperatures,⁶ due to lack of minimum flow releases from Calaveras Reservoir. Flow releases are required to keep these fish populations in good condition.

The SFPUC, as part of a Memorandum of Understanding (MOU) signed with the California Department of Fish and Game (CDFG) in 1997, promised to restore minimal flows to approximately five miles of Alameda Creek, but to date has not released water for this purpose. The NOP describes two components of the Project: "replacement of the existing dam at Calaveras Reservoir to meet seismic safety and delivery/drought reliability requirements, and

⁴ Gunther, A. J. et al. 2000. An Assessment of the Potential for Restoring a Viable Steelhead Trout Population in the Alameda Creek Watershed. Prepared for the Alameda Creek Fisheries Restoration Workgroup.

⁵ San Francisco Public Utilities Commission. 2000, 2001, 2002, and 2004. Alameda Creek aquatic resource monitoring reports: summer and fall 1998; summer and fall 1999; 2000; 2001; and 2002. Prepared by SFPUC Water Quality Bureau, Sunol, CA.

⁶ San Francisco Public Utilities Commission. 2000, 2001, 2002, and 2004. Alameda Creek aquatic resource monitoring reports: summer and fall 1998; summer and fall 1999; 2000; 2001; and 2002. Prepared by SFPUC Water Quality Bureau, Sunol, CA.

Hanson Environmental, Inc. 2002. Air and water temperature monitoring within Alameda Creek. Draft report submitted to the San Francisco Public Utilities Commission. March 30, 2002.

operation of Calaveras Reservoir to release up to 6,300 acre-feet per year of water to Calaveras and Alameda Creeks for enhancement of fisheries and the other natural resources of the creeks.”

The MOU agreed upon the releases referenced in the NOP of less than 6,300 acre-feet (af) of water annually, flows intended to benefit a resident rainbow trout population in 5 miles of stream, and minimal enough so as to be of questionable value for anadromous fish. These flows were not intended to meet the habitat needs of anadromous fishes such as steelhead trout, salmon, or lamprey. The MOU also allows these flow releases to be recaptured downstream in the vicinity of the Sunol Valley Water Treatment Plant. It is important to note that the MOU flows are required minimum stream flows at the confluence of Calaveras and Alameda Creeks, not flows that must be released from Calaveras Reservoir. During most winters, the flows required under the MOU from November 1 through March 15 will be met by natural stream flow in Alameda Creek, thus requiring little or no flow releases from Calaveras Reservoir by the SFPUC. For normal and wet water years, summer releases would be the only truly enhanced stream flow, so that in most years the SFPUC would release only 3,150 af under the proposed Project. The EIR for the Project must discuss the rationale and scientific basis for the proposed flow schedule and whether these flows are adequate for all life stages of anadromous fish.

The MOU does not address Fish and Game Code §5937 violations for fish between the ADD and the confluence of Calaveras and Alameda Creeks. Also, the National Marine Fisheries Service (NMFS) has proposed listing resident rainbow trout below the ADD and Calaveras Dam as threatened species under the Endangered Species Act, with a final listing determination due in December of 2005. The ACA has called upon the SFPUC to scrap the 1997 MOU flows, and replace them with adequate flows for steelhead trout and to meet the SFPUC’s §5937 obligations. NMFS and CDFG are currently meeting with the SFPUC to revise the 1997 MOU and the minimum flows. Under the proposed Project, even with the proposed flow releases contemplated in the NOP, operation of both dams will likely cause violations of §5937 and unauthorized take of listed trout populations. The Project must include elements that address these violations and the potential for unauthorized take.

Flows studies to determine the habitat needs of steelhead trout and other native fish downstream of the SFPUC dams must be completed and included in the EIR for the Project. The Alameda Creek Fisheries Restoration Workgroup, with SFPUC involvement, is currently working on an agreement for flows studies to determine this information. The ACA has also previously asked the SFPUC to identify the average annual natural stream flow at the confluence of Calaveras and Alameda Creeks, to determine whether these flows meet or surpass the proposed minimum flows in the 1997 MOU. The ACA has also asked for a record of the amount and timing of water diversions at the ADD. The SFPUC has yet to supply this information. This information must be provided as part of the EIR for the Project, to determine the ecological benefit of the proposed releases of less than 6,300 af annually.

The NOP for the Project contemplates releasing water for environmental purposes from Calaveras Dam through a new 12” pipe and a 72” low-volume cone valve. The EIR for the Project should identify whether this cone valve would be able to release flows adequate for steelhead trout restoration, including flows needed for migration. Any infrastructure built for water releases for environmental purposes should accommodate the full range of flows that may be required for anadromous fish. Also, periodic scouring flows may be required in Alameda Creek below Calaveras Dam to maintain ecosystem function and maintain suitable trout habitat, as discussed below. The EIR for the Project should identify how such flows would be released.

Restore Ecosystem Function

Calaveras Dam and the ADD interrupt ecosystem function in Alameda Creek, by blocking transport of sediment (including fish spawning substrate) and woody debris, and reducing scouring flows. The EIR should evaluate a range of alternatives for restoring ecosystem function below these dams, including:

- transporting sediment from above Calaveras Dam and/or the ADD to Alameda Creek below the dams through a bypass canal, fish ladder or discharge pipe, with an emphasis on transporting suitable spawning substrate;
- capturing and hauling spawning substrate from above Calaveras Dam and/or the ADD to Alameda Creek below the dams;
- periodically releasing scouring flows from Calaveras Reservoir adequate to maintain suitable spawning habitat below the dam; and
- placing suitable and appropriate woody debris in Alameda Creek below the dams to enhance spawning and rearing habitat.

No Dam Enlargement

The SFPUC proposes to rebuild Calaveras Dam with a wider core that could accommodate enlargement of the dam in the future. The NOP for the Project states that although the “SFPUC does not reasonably foresee the need for a larger dam beyond one that restores the reservoir's historical capacity; the dam would be designed to allow potential future reuse of dam components without requiring otherwise more extensive dam removal and rebuilding if an enlargement were ever undertaken in the future.” Since the SFPUC claims there is no foreseeable need for expanding the dam in the future, the design and engineering of this project should be restricted to the 96,850 af of storage capacity identified as appropriate for replacing the existing dam. Engineering the structure for later expansion will increase the threats to habitat in the two Regional Wilderness Areas adjacent to the dam, and is contrary to the SFPUC’s adopted stewardship policy.

No Recapture Facility

The NOP for the Calaveras Dam Replacement Project does not mention the SFPUC proposal to construct a water recapture facility (including a rubber dam) in the Sunol Valley, the so-called “Alameda Creek Fishery Enhancement Project.” However, the NOP for the Programmatic EIR for the WSIP indicates the “Enhancement Project” will be a part of the Calaveras Dam Replacement Project. The EIR should clarify whether or not this is an element of the proposed Project.

The “Enhancement Project” involves construction of an unneeded rubber dam and recapture facility in the Sunol Valley, at an estimated cost of \$17.5 million. The SFPUC has insisted on recapture of the water to be released under the 1997 MOU. The proposed recapture facility is not a legitimate enhancement project, as it has no benefit for native fish and wildlife and the facility itself will likely degrade aquatic habitat in Alameda Creek. The Alameda Creek Fisheries Restoration Workgroup does not have consensus that the rubber dam project is essential to the steelhead restoration, and has not listed it as an essential action in its *Draft Steelhead Restoration Action Plan for the Alameda Creek Watershed*.

The proposed rubber dam would create a seasonal impoundment in a stream section that is currently relatively pristine. A dam and water impoundment at this location could affect fish

passage, even with a fish ladder. The impoundment would also increase water temperature and create habitat favourable for predatory fish and bullfrogs. The recapture facility would have impacts on listed and sensitive species known to inhabit the “Enhancement Project” area, including rainbow trout, Pacific lamprey, California red-legged frog, California tiger salamander, and western pond turtle.

The “Enhancement Project” also includes an attempt to illegally divert more water from Alameda Creek, a blatant water grab that will degrade rather than restore Alameda Creek. The 1997 MOU (Section 4.4) memorializes a supposed SFPUC water right to recapture not just “the amount of water released as part of the Calaveras Reservoir stream release and recapture program” but also “historic annual diversions at the Sunol Filter Galleries.” It is questionable whether the SFPUC has a valid water right to renew these diversions since they have discontinued the filter gallery diversions and do not have an established beneficial use.

Recently, 68 Bay Area conservation organizations representing tens of thousands of Bay Area residents sent the SFPUC a letter requesting that the agency abandon efforts to construct the recapture facility and rubber dam. The “Alameda Creek Fishery Enhancement Project” should not be a part of the Calaveras Dam Replacement Project. If the “Enhancement Project” is included in the Project the EIR must fully evaluate all the potential environmental impacts, and should evaluate a range of alternatives to the recapture facility, including:

- not recapturing any of the water released from Calaveras Reservoir;
- allowing any water released from Calaveras Reservoir to be recaptured further downstream; or
- recapturing water released from Calaveras Reservoir at another location or by means other than a rubber dam.

Protect Reservoir Fish

The Project should include reservoir infrastructure and operations to protect the landlocked reservoir trout population in Calaveras Reservoir. The NOP notes that “a new intake tower connecting to an existing drain and three water inlet adits” will be constructed in Calaveras Reservoir. Any of these adits with the potential to divert or entrain juvenile trout must be screened according to NMFS criteria to protect juvenile trout. Also, the SFPUC recently completed the Calaveras Dam Oxygenation Project, to protect water quality and fish habitat in the reservoir. The oxygenation equipment should be used to expand suitable summer trout habitat in the reservoir. Installation of fish screens and operation of the oxygenation equipment to benefit fish should be evaluated in the EIR for the Project.

The Alameda Creek Alliance looks forward to working with the SFPUC and the S. F. Planning Department to incorporate adequate stream flow releases, fish passage, and other restoration elements for Alameda Creek that will allow us to support the Project and help the environmental review and permitting process to move forward quickly and cooperatively.

Sincerely,

Jeff Miller

Director, Alameda Creek Alliance

cc: National Marine Fisheries Service
California Department of Fish and Game
U. S. Army Corps of Engineers
San Francisco Public Utilities Commissioners
San Francisco Board of Supervisors
Alameda Creek Fisheries Restoration Workgroup
Bay Area Water Stewards
SFPUC Water Supply and Treatment Division
SFPUC Land and Resources Management Section

Letter No. 4



Alameda Creek Alliance
 PO Box 192 • Canyon, CA • 94516
 (510) 499-9185
 e-mail: alamedacreek@hotmail.com
 web site: <http://www.alamedacreek.org>

November 23, 2005

San Francisco Planning Department
 Attention: Paul Maltzer
 Environmental Review Officer, Calaveras EIR
 30 Van Ness Avenue, Suite 4150
 San Francisco, CA 94103

City & County of S.F.
 Dept. of City Planning

NOV 29 2005

OFFICE OF
 ENVIRONMENTAL REVIEW

Re: Supplemental Scoping Comments on Calaveras Dam Replacement Project

These are supplemental comments of the Alameda Creek Alliance (ACA) on the SFPUC's proposed Calaveras Dam Replacement Project (Project).

Since the proposed Project includes rebuilding Calaveras Dam with a wider core that could accommodate enlargement of the dam in the future, the EIR/EIS for the Project must analyze the potential growth inducing impacts and potential impacts to endangered and threatened species and their habitat from future reservoir enlargement.

The Notice of Preparation (NOP) for the Project does not discuss whether fill material from the proposed Apperson Quarry may be used for constructing the new Calaveras Dam. Mining at Apperson Quarry would have significant impacts on a number of federally listed species and the Sunol tule elk herd, as well as visual and noise impacts to Sunol Regional Wilderness and potential traffic impacts to Sunol, Calaveras Road, and Welch Creek Road. The EIR/EIS for the Project must identify and fully mitigate any such significant impacts.

The proposed Project would mine 2.4 million cubic yards of earth from borrow areas around Calaveras Dam to construct the new dam. It is unclear from the NOP whether any of the proposed borrow or disposal sites are habitat for listed or sensitive species. The EIR/EIS for the project should clearly show species habitat areas and proposed borrow and disposal areas. Some of the proposed borrow sites will have significant visual and aesthetic impacts on Sunol Regional Wilderness. The EIR/EIS for the project should consider other potential sources for fill materials, including importing fill material from alternative sites that will not result in impacts to listed species or to the wilderness character of Sunol Regional Wilderness.

Sincerely,

Jeff Miller

Director, Alameda Creek Alliance

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12/06/2005 18:14 4152741820



Alameda Creek Alliance
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Letter No. 5

December 20, 2005

San Francisco Planning Department
 Attention: Paul Maltzer
 Environmental Review Officer, Calaveras EIR
 30 Van Ness Avenue, Suite 4150
 San Francisco, CA 94103

Re: Supplemental Scoping Comments on Calaveras Dam Replacement Project Final Engineering Report

These are supplemental comments of the Alameda Creek Alliance (ACA) on the SFPUC's proposed Calaveras Dam Replacement Project (Project). The ACA just recently became aware of the SFPUC's *Final Conceptual Engineering Report: Dam and Appurtenant Structures*, dated October 31, 2005, prepared by URS. The SFPUC did not notify the ACA that this report had been published nor did it make the public aware of the existence of this report during the comment period for the draft EIR/EIS for the Project. The report was found on an unpublicized link on the SFPUC web site. Accordingly, we ask that these comments be included in the record for the draft EIR/EIS for the Project.

After reviewing the descriptions of the proposed borrow and disposal areas for the project and the potential impacts to special-status species and their habitat, the ACA encourages the SFPUC to prioritize use of borrow and disposal areas that are either: between the current maximum restricted water surface elevation of 705 feet and the original reservoir surface elevation of 756 feet; or off-site borrow and disposal areas that do not have impacts to special-status species or their habitat. Similarly, the SFPUC should prioritize staging areas and haul roads that avoid or minimize impacts to special-status species and their habitat.

Appendix B of the *Final Conceptual Engineering Report*, the *Reservoir Operations Plan* states on pages B-3 and B-4 that the Calaveras Creek and Alameda Creek stream flows required to be released from Calaveras Reservoir as a result of the 1997 MOU with the CA Department of Fish and Game have "not been fully implemented because of the current limitations on storage" and "because of the storage restriction ordered by DSOD at the reservoir. This is a misrepresentation of the limitations the DSOD drawdown places on the SFPUC's ability to immediately release flows from the reservoir. Although current water storage in Calaveras Reservoir is at 60% less than the maximum before the DSOD drawdown, the SFPUC's yield (available treated water supply) from Calaveras has only been minutely affected by the DSOD operating restrictions on Calaveras Reservoir. According to the Notice of Preparation for the Water System Improvement Program PEIR published by the SFPUC, Calaveras yield is currently 219 mgd, fully 98% of the normal system yield of 223 mgd. This means that water is currently available for flow releases to Calaveras Creek and Alameda Creek, but that the SFPUC chooses to divert this water to its water treatment plant instead.

We would also like to comment on the potential for evacuating the reservoir to deadpool elevation discussed in section B-6 on Extraordinary Operations. The draft EIR/EIS should

1

discuss the SFPUC's contingency plans to protect the sensitive fishery resources of landlocked steelhead trout and Sacramento perch in Calaveras Reservoir and to adequately mitigate for any impacts in the event of a drawdown to deadpool.

Thank you for the opportunity to comment on the *Final Conceptual Engineering Report* for the Calaveras Dam Replacement Project.

Sincerely,

Jeff Miller

Director, Alameda Creek Alliance

Letter No. 6

"Laura Allen" <lallen@ebcc-school.org>
To <diana.sokolove@sfgov.org>
11/22/2005 03:37 PM
Subject Calaveras Dam

Dear Diana,

I am an elementary school teacher in Oakland California. My students and I study water and are very concerned about the health of California's rivers. We are involved in a project to hatch Rainbow trout in our classroom and my students and I are striving to create a healthy world for all species.

Because of our beliefs we are asking you to include adequate water releases from the Calaveras Reservoir to restore steelhead trout in Alameda Creek below the dam. Also, we request that there is fish passage for migrating fish to pass the new dam.

Thank you for thinking of future generations in your decision making process.

Regards,

Laura Allen
East Bay Conservation Corps Charter School
Oakland CA, 94608

12/06/2005 18:07 4152741820

Letter No. 7
City & County of S.F.
Dept. of City Planning



NOV 29 2005

November 28, 2005

OFFICE OF
ENVIRONMENTAL REVIEW

Paul Maltzer, Environmental Review Officer, WSIP PEIR
San Francisco Planning Department
30 Van Ness Avenue, Suite 4150
San Francisco, CA 94103

Re: Notice of Preparation -- SFPUC Calaveras Dam Replacement Project (Case No. 2005.0161E)

Dear Mr. Maltzer,

The Bay Area Water Supply and Conservation Agency (BAWSCA) represents the interests of 26 cities and water districts, an investor-owned utility, and a university that purchase water wholesale from the San Francisco regional water system. These agencies, in turn, provide water to 1.7 million people, businesses, and community organizations in Alameda, Santa Clara, and San Mateo counties. Consequently, BAWSCA has a profound interest in the Regional Water System of which the above referenced project is an important component, and supports San Francisco's efforts to rebuild this reservoir as it rebuilds the regional water system.

BAWSCA offers the following comments in response to the Notice of Preparation (NOP) for the Calaveras Dam Replacement Project:

1. Goals and Objectives

The Calaveras Dam Replacement Project (Project) is a component of the Water System Improvement Program (WSIP). It is therefore especially important that the Project's goals be aligned with those of the WSIP. The basic goals of the WSIP, as described on page 1 of the Project NOP, are "to increase the reliability of the system with respect to water quality, seismic response, water delivery and water supply to meet water purchase requests in the service area through the year 2030." On page 4 of the NOP, the primary goal of the Calaveras Dam Replacement Project is described as "meet[ing] the seismic reliability goal of the WSIP," with the additional goal of restoring former water storage capability in order to help meet the delivery and drought reliability goals of the WSIP. The WSIP's water supply goal is not listed as a goal of the Project.

However, the Water System Improvement Program Assessment (WSIP Assessment Report) prepared for the San Francisco Public Utilities Commission (SFPUC) on October 21, 2005 states on page 4-16 that:

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Mr. Paul Maltzer
November 28, 2005
Page 2 of 5

The Calaveras Dam is an integral part of the Sunol Valley facilities. . . . These facilities have not been identified as necessary to operate following an earthquake, as Hetch Hetchy is not expected to be out of service following an earthquake. Therefore, the primary LOS goal for the [Project] should be changed to delivery reliability, with secondary LOS goals being water supply and seismic reliability.

There are good reasons for the WSIP Assessment Report's conclusion that water supply should be a goal of the Project. The future capacity and operation of Calaveras Reservoir is relevant to a number of the water supply components of the WSIP. These components include such critical matters as storage facilities needed to achieve a specified level of reliability, adequate supply to meet projected water purchases, and water supply in the event of drought rationing.

Without an accurate and clear statement of the Project's goals, it will be difficult to develop a reasonable range of alternatives to evaluate in the Environmental Impact Report (EIR). **BAWSCA therefore suggests that the Project EIR include a water supply goal in order to harmonize the Project goals with those of the WSIP.**

2. Project Description and Operation

a. Project Must Restore Historical Water Supply Yield of Reservoir

Page 10 of the NOP refers to the 1997 Memorandum of Understanding (MOU) by which the SFPUC agreed to release 6,300 acre feet per year (AFY) of water from the Calaveras Reservoir into Calaveras Creek. However, the NOP does not mention that the MOU also provides for the recapture of that water farther downstream. Without such water recapture capability, restoration of the reservoir to its historical 96,850 AF volumetric capacity will not result in a similarly sized water supply yield. In fact, without the recapture of the released 6,300 AFY, any new dam will need to be larger than the planned size in order to reach historical water supply levels. **As restoring historical reservoir capacity is an integral purpose of this Project, BAWSCA suggests that the EIR clarify that the Project will result in a dam large enough to ensure, at a minimum, restoration of the historical water supply yield provided by Calaveras Reservoir.**

b. Additional Project Elements Should be Considered

Silt Removal: The Executive Summary in the Final Conceptual Engineering Report for the Calaveras Dam Replacement Project dated October 31, 2005, notes that sedimentation has reduced the reservoir capacity to approximately 92,000 acre-feet. Therefore, in order to restore Calaveras Reservoir capacity to the original 96,850 acre-foot storage capacity, part of this Project will necessarily involve silt removal, yet the NOP is silent as to any silt removal component of the Project. On the other hand, it is possible that silt removal is not contemplated, but that the proposed dam will support a Reservoir storage capacity of 96,850 AF in spite of the historical sediment deposit. **BAWSCA suggests that the EIR clarify whether historical**

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Reservoir water supply yield will be achieved in spite of sedimentation. If silt removal will be required, the EIR should analyze the environmental impacts associated with such removal.

New Recapture Facilities: The draft WSIP (dated October 21, 2005) describes plans for an inflatable rubber dam downstream of the Sunol Valley Water Treatment Plant, with associated pipelines and pumping in order to recapture the water released for fisheries and return it back to the system. Such facilities were mentioned in the NOP for the WSIP Program EIR as part of the combined project that included the Alameda Creek Fishery Enhancement work. The WSIP notes that these "proposed alternatives may require re-evaluation as the Calaveras Dam Replacement Project proceeds." Yet the Project NOP is silent as to any recapture facilities to be installed downstream of the Dam. **If indeed these facilities are part of the Project, BAWSCA suggests that the EIR include analysis of any associated environmental impacts.**

3. **Project Alternatives**

a. Alternative Dam That is Not Designed to Accommodate Future Enlargement

BAWSCA recognizes that the WSIP is a flexible document whose contents have not yet been finally determined. In fact, the SFPUC will be meeting on November 29 to consider adopting a recently-revised version of the WSIP which would make substantial changes to the projects and schedules. Even then, a number of water supply options will still be under consideration and a variety of drought scenarios are being analyzed in the Program Environmental Impact Report (PEIR) for the WSIP. It is important that the Project not conflict with, or narrow the flexibility of the WSIP and the PEIR. The NOP states that one alternative to the Project to be evaluated is an alternative dam that would not be designed with a wide core that could accommodate enlargement of the dam in the future. **BAWSCA suggests that this alternative will interfere with the necessary flexibility required for the PEIR and the WSIP and therefore should not be considered as an alternative.**

b. Alternative Dam That is Larger Than That Proposed

If water supply is a goal of this Project, which Parsons' WSIP Assessment Report is correct in stating that it should be, it follows that the necessary evaluation of a reasonable range of alternatives could include an analysis of a larger dam than proposed, in order to provide the needed flexibility for implementation of the as-yet-undetermined water supply components of the WSIP. BAWSCA therefore suggests that the EIR evaluate a Project alternative that includes building a dam with a larger capacity than that proposed.

As discussed above, the size of Calaveras Reservoir is critically related to a number of storage and supply components of the WSIP. This is particularly the case if, as discussed above, SFPUC does not intend to recapture the 6,300 AFY released pursuant to the 1997 MOU. It may well be that a larger Calaveras Reservoir might

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be a desirable, and even an environmentally superior, solution to the water supply issues that are still unresolved in the WSIP. Even at historical levels, Calaveras Reservoir did not have enough storage capacity to prevent the severe drought rationing that SFPUC had to impose during five of the past twenty-nine years. Expanding the reservoir to allow for increased storage of water during years of high precipitation and high river flows would put less stress on the Tuolumne River than diversions during dry year cycles, reduce the need for extreme rationing, or both.

BAWSCA therefore suggests that the EIR analyze an alternative that provides for a larger dam and increased storage capacity at Calaveras Reservoir, beyond its historical capacity, in order to maximize the Reservoir's potential for fulfilling the WSIP's storage and supply requirements.

c. Alternative Reservoir Fishery Release Schemes

One component of the project is to release up to 6,300 AFY of water to Calaveras and Alameda Creeks for enhancement of fisheries and other natural resources of the creeks. There are a number of possible release schemes that would optimize different environmental objectives. For example, releases to meet certain instream temperature objectives may follow a different pattern than releases to maintain certain water depths or velocities. Meeting multiple fish release objectives for any fixed amount of water supply reliability could require a larger reservoir and dam, or reduce the yield available for customers during droughts and other periods. The examination of the potential to provide different environmental benefits should not be done at the expense of achieving the project's water supply goals. In addition, these alternate release schemes will have different environmental impacts. **BAWSCA suggests that the EIR concurrently consider alternative reservoir sizes and release schemes to meet water supply goals and provide fishery enhancement flows.**

4. Consideration Now of the Environmental Impacts of Future Enlargement.

While BAWSCA believes that the EIR should analyze immediate construction of a larger dam, we also recommend that (1) the EIR retain the principal focus on a dam which, at a minimum, is designed and engineered to accommodate future expansion, and (2) the EIR address the environmental impacts of such a future enlargement of the proposed dam. The NOP suggests that future enlargement is not reasonably foreseeable and that therefore the California Environmental Quality Act (CEQA) does not require analysis of a larger dam's environmental effects.¹ This conclusion is problematic, regardless of whether or not it is correct. If such a conclusion is correct, then it is predictable that conditions will be placed on the Project that will make it extremely difficult, both legally and politically, to implement

¹ The NOP also states on page 6 that any future expansion would require additional water rights from the State Water Resources Control Board (SWRCB). While this statement may be true as regarding increased diversion from Calaveras Creek and Arroyo Honda, storing additional Tuolumne River water in Calaveras Reservoir will not require any action by the SWRCB.

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an enlargement at any time in the future. On the other hand, if such a conclusion is incorrect, and this letter suggests scenarios in which a larger reservoir might be required in order to implement the WSIP level of service goals, failing to address these incremental impacts, at least as to the site-specific effects of a larger impoundment, invites challenges that could potentially delay the rebuilding of the dam even to its historical capacity. **BAWSCA suggests that the Project EIR analyze the environmental impacts of a future enlargement of the proposed dam.**

Please do not hesitate to contact me should you have any questions about our comments. BAWSCA looks forward to assisting the SFPUC as it goes forward with the environmental review process.

Sincerely,


Arthur R. Jensen
General Manager

ARJ:NMS

cc: Board of Directors
Technical Advisory Committee
Susan Leal, SFPUC

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Letter No. 8

17 November 2005

Dear Mr. Maltzer,

Re: Calaveras Dam Replacement Project

While considering the Calaveras Dam replacement project, please include adequate water releases from Calaveras Reservoir to restore steelhead trout in Alameda Creek, fish passage for migratory fish past the new dam and removal of the Alameda Diversion Dam. I'm counting on San Francisco doing the right thing for Alameda Creek.

Please respond with your position.

Respectfully submitted,

Truman L. Burns

856 Sibert Ct.

Lafayette, CA 94549

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State of California - The Resources Agency

DEPARTMENT OF FISH AND GAME

<http://www.dfg.ca.gov>POST OFFICE BOX 47
YOUNTVILLE, CALIFORNIA 94599
(707) 944-5500Letter No. 9
ARNOLD SCHWARZENEGGER, Governor

November 22, 2005

City & County of S.F.
Dept. of City Planning

NOV 29 2005

OFFICE OF
ENVIRONMENTAL REVIEWMs. Diana Sokolove
City and County of San Francisco
Planning Department
30 Van Ness Avenue, Suite 4150
San Francisco, CA 94103
Via Fax: (415) 558-5991

Dear Ms. Sokolove:

Calaveras Dam Replacement Project
SCH 2005102102

Department of Fish and Game (DFG) personnel have reviewed the Calaveras Dam Replacement Project (Project) draft Environmental Impact Report (DEIR), Notice of Preparation (NOP), prepared by the City and County of San Francisco through the San Francisco Public Utilities Commission (SFPUC), dated October 25, 2005, and the subsequent potential significant impacts related to this project.

The NOP has identified potential significant impacts to special status species and their habitats from actions related to the proposed construction and on-going operation of the Project. These impacts include potential borrow, spoil disposal, and staging areas; construction of temporary haul roads; restoration of the dam surface water height to its former level (756 feet); and construction of the new dam which would continue to divert water from instream resources that exist in the Alameda Creek Watershed. The area surrounding the Calaveras Dam is known to provide habitat for land-locked steelhead trout (*Oncorhynchus mykiss*), a species proposed to be listed as "Threatened" under the Federal Endangered Species Act (FESA) and included as part of the California Central Coast Evolutionarily Significant Unit (CCC ESU for steelhead).

The proposed listing of this trout population is based on results of recent genetic and behavioral studies that have determined that the population of trout within Calaveras Reservoir watershed to be "land-locked steelhead." In addition the area surrounding Calaveras Reservoir is known to be habitat for California red-legged frog (*Rana aurora draytonii*), a species Federally listed as "Threatened"; California tiger salamander (CTS) (*Ambystoma californiense*), a species Federally listed as "Threatened"; foothill yellow-legged frog (*Rana boylei*), a State and Federal Species of Special Concern; western pond turtle (*Clemmys marmorata*), a State Species of Special Concern; Alameda whipsnake (*Masticophis lateralis euryxanthus*), a species State and Federally listed as "Threatened"; Calliope silverspot butterfly (*Speyeria callippe callippe*), a species Federally listed as "Endangered"; Berkeley kangaroo rat (*Dipodomys heermanni*

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berkeleyensis), a species previously presumed extinct; and a number of other special status plants and animals.

California red-legged frog, foothill yellow-legged frog, and western pond turtles depend on upland areas adjacent to Calaveras, Arroyo Hondo, and Alameda creeks and associated wetland features that exist near these creeks and within dispersal distance of the project site. The low gradient reaches of tributaries to Calaveras Reservoir (the reaches closest to Calaveras Reservoir) are particularly important habitat for breeding of foothill yellow-legged frogs, the spawning of land-locked steelhead (and other native fish), and for various life history stages of California red-legged frogs and western pond turtles.

CTS have been documented in the vicinity of the project area and specifically on the arm of Arroyo Hondo that reaches into Calaveras Reservoir which is a proposed spoils disposal site for this project; suitable breeding habitat likely occurs within dispersal distance of the entire project area. The distance CTS disperse has been found to be much farther than originally assumed. CTS move long distances, up to one mile, between breeding habitats and aestivation sites through areas which are periodically disked or disturbed. Mitigation for this species must take into account the different biological and ecological requirements of the aquatic early stages and the largely terrestrial adults. Failure to adequately consider either of these life history stages may lead to elimination or reduction of the animals.

The Berkeley kangaroo rat is one subspecies of the Hermann's kangaroo rat. Kangaroo rats forage at night, collecting and carrying seeds in external cheek pouches to burrows or small pits in the ground where food is cached. They may also eat herbs and insects. Kangaroo rats have special adaptations and habits that help them conserve water and survive the arid conditions of their habitat. The Berkeley kangaroo rat was known to live in a few locations near the hills of Berkeley, Eureka Peak, Orinda Lake, Mt. Diablo, and Calaveras Reservoir; it was found in the 1940's near the vicinity of Calaveras Dam. The Berkeley kangaroo rat has recently been rediscovered by the East Bay Regional Park District and should be added to the list of species present and assessments of the population (including genetic analyses) should be performed. A survey protocol for Berkeley kangaroo rat should be developed in concert with DFG and the U. S. Fish and Wildlife Service (USFWS). The SFPUC should conduct comprehensive surveys to determine conclusively whether the species is present in the area. If detected, the SFPUC should consider the impacts of covered activities on the Berkeley kangaroo rat. If shown to still exist, the species would likely be a candidate for emergency Federal listing.

DFG recommends a complete assessment of the flora and fauna within and adjacent to the project area, with particular emphasis upon identifying endangered,

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threatened, and locally unique species and sensitive habitats, should be provided to account for and protect special status species and habitat. Rare, threatened and endangered species to be addressed should include all those which meet the California Environmental Quality Act (CEQA) definition (see CEQA Guidelines, Section 15380). The assessment should identify any rare plants and rare natural communities, following DFG's Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities (revised May 8, 2000). The Guidelines are available at www.dfg.ca.gov/whdab/pdfs/guideptt.pdf.

Please be advised that a California Endangered Species Act (CESA) Permit must be obtained if the project has the potential to result in take of species of plants or animals listed under CESA, either during construction or over the life of the project. Issuance of a CESA Permit is subject to CEQA documentation; therefore, the CEQA document must specify impacts, mitigation measures, and a mitigation monitoring and reporting program. If the project will impact CESA listed species, early consultation is encouraged, as significant modification to the project and mitigation measures may be required in order to obtain a CESA Permit.

In addition, DFG is concerned that although the SFPUC signed a Memorandum of Understanding (MOU) with DFG in 1997, as of today's date, the SFPUC has not released flows from Calaveras Dam in compliance with the 1997 MOU and therefore, has not released sufficient flows to keep in good condition downstream aquatic resources in Alameda Creek. After a letter of complaint from California Trout (Cal Trout) to the State Water Resources Control Board (SWRCB) dated September 24, 1990, the SFPUC entered into the 1997 MOU with DFG so as to be in compliance with Fish and Game Code 5937 at Calaveras Reservoir. Fish and Game Code 5937 states, "The owner of any dam shall allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam."

DFG is also aware that since the winter of 2001, the SFPUC has had to lower the surface water elevation at Calaveras Reservoir in order to comply with the California Department of Water Resources Division of Safety of Dams (DSOD) regulations. In a letter dated October 14, 2004, we stated our knowledge that the SFPUC has had to lower the surface water elevation and that we acknowledge the necessity to operate Calaveras Reservoir in a safe manner. However, we expressed our concern that by lowering the surface water elevation without establishing a mechanism for fish passage, the SFPUC has put the known population of land-locked steelhead trout at significant risk and as well has likely placed itself out of compliance with Fish and Game Code Section 5901 which states that, "Except as otherwise provided in this code, it is unlawful to construct or maintain in any stream in Districts 1, 1-1/2, 2, 2-1/2, 2-3/4, 3, 4, 4-1/2,

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23, and 25, any device or contrivance which prevents, impedes, or tends to prevent or impede, the passing of fish up and down stream." Section 5901 covers Alameda and Santa Clara counties, District 3.

DFG's concerns about the potential fish passage problems associated with the lowering of the surface water elevation were corroborated during a field site visit made by SFPUC, the National Marine Fisheries Service (NOAA Fisheries), and DFG staff on August 17, 2004. During the creek assessment, DFG staff observed that lowering of the surface water elevation had resulted in a significant lack of hydrological connection (approximately 1.5-mile dry zone) between Arroyo Hondo and Calaveras Reservoir and that there were numerous adult-sized steelhead trout residing in the upstream perennial pools. We recommended that the SFPUC implement fish passage and enhancement measures (i.e., tree planting, building/maintaining cattle-exclusion fences, maximizing surface water elevation at Calaveras Reservoir to provide passage at critical times, creating low flow channel, etc.) as soon as possible to minimize the significant impacts to the known population of land-locked steelhead trout and to comply with Fish and Game Code Section 5901. DFG is aware that the SFPUC has been installing and repairing fences within the San Antonio Reservoir watershed, but was concerned to see during a field site visit in June 2005, cattle present at the stream-side of the fences. DFG recommends a monitoring and adaptive management component for the fence exclusion program to ensure it functions as designed in the Alameda Creek watershed.

DFG and SFPUC are currently discussing the interim operations of Calaveras Reservoir with the goal of protecting aquatic resources both upstream and downstream of Calaveras Reservoir while minimizing impacts to aquatic species at the nearby San Antonio Reservoir which also serves as a water supply. Steelhead trout located upstream of San Antonio Reservoir is also proposed to be listed as "Threatened" under the FESA and included as part of the CCC ESU for steelhead. In our October 14, 2004 letter, we stated "the SFPUC has proposed to address the interim operation of Calaveras Reservoir in their Habitat Conservation Plan (HCP), but it is the opinion of DFG that the HCP process is not moving quickly enough to remedy this urgent fish passage and legal issue with DFG." We are still concerned about the potential lack of hydrological connections between both Calaveras and San Antonio reservoirs and their tributaries. We continue to be available to provide guidance to SFPUC staff to remedy this important issue.

DFG requests, as part of the environmental review process for the Project, that both interim and long-term operations of Calaveras Dam be addressed through the following:

1. A habitat-based stream assessment for Calaveras, Arroyo Hondo, and Alameda creeks, done at a seasonally appropriate time period that incorporates habitat

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and life history criteria of species which may be impacted by the Project. DFG recommends that all species listed in this letter which are not included in the NOP be added to the assessment.

2. A hydrologic study be conducted to determine the amount of water that is needed to support steelhead trout through critical reaches under various water year conditions within the reaches affected by the Project, specifically the reach of Alameda Creek from Alameda Creek Diversion Dam downstream to Alameda Creek's confluence with Arroyo de la Laguna.
3. A specific proposal to provide minimum bypass flows for both Calaveras Dam and the Alameda Creek Diversion Dam for maintenance of habitat for fish and other aquatic species, taking into account current and projected water operation scenarios of the SFPUC's regional water system. At this time, both the Alameda Creek Diversion Dam and Calaveras Reservoir are out of compliance with Fish and Game Code 5937 which requires dam owners to release enough water to keep downstream fish populations in good condition. This proposal should also consider utilizing the SFPUC's related water storage facilities within the Alameda Creek watershed (i.e., San Antonio Reservoir) to meet the needed minimum bypass flows in the affected reach of Alameda Creek and in particular passage flows needed through Sunol Valley.
4. An assessment of the impacts of Calaveras Dam and the Alameda Creek Diversion Dam on channel forming flows with a specific proposal to provide periodic channel maintenance and flushing flows that are representative of the natural hydrograph that existed before the original construction of Calaveras Dam.
5. An analysis of current and projected operational scenarios for Calaveras Reservoir and their impacts to the existing population of land-locked steelhead trout that utilize Calaveras Reservoir and Arroyo Hondo throughout various stage of the steelhead trout's life cycle. This study should include a plan to preserve the existing population of steelhead trout during interim operations (preconstruction) and post construction operations of Calaveras Dam. The concerns to be addressed include the following:
 - a) Maintain fish passage between the reservoir and Arroyo Hondo by keeping reservoir water elevations as high as possible during the period when adult trout migrate upstream from the reservoir through the end of the downstream (adult and juvenile trout) migration season.
 - b) Maintain channel integrity (maintain active channel / minimize delta / maximize hydrological connectivity) of Arroyo Hondo.

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- c) Maintain physical carrying capacity for trout in Calaveras Reservoir during the summer and fall period by keeping water elevations as high as possible.
 - d) Maintain adequate water temperatures and dissolved oxygen for trout in the reservoir throughout the summer and fall periods. The concentration of dissolved oxygen in reservoirs is often the limiting factor for trout survival in San Francisco Bay Area reservoirs. DFG recommends targeting a specific dissolved oxygen concentration of 7 mg/L so as to minimize impacts to land-locked steelhead especially during times of lowered surface water elevation (current operations as per DSOD requirements).
 - e) Provide flow releases to the stream channel below Calaveras Reservoir dam to encourage riparian vegetation growth, invertebrate productivity, adequate dissolved oxygen, low water temperatures, and provide some rearing habitat for juvenile steelhead trout and spawning adult steelhead trout. The SFPUC, under the aforementioned 1997 MOU with DFG, agreed to specific flow releases to provide habitat for resident rainbow trout and other native fish species downstream of Calaveras Reservoir based on the knowledge of fish migration barriers being present in the lower downstream reaches of Alameda Creek. At this time, however, there is active fish passage remediation at these barriers. The SFPUC will need to assess adequate flows for anadromous steelhead trout and will need to renegotiate with DFG such that adequate flows are released to comply with Fish and Game Code 5937.
 - f) Eliminate or minimize the loss of adult and juvenile trout from Alameda Creek through the Alameda Creek Diversion Dam.
 - g) Determine how operation and interim operation of Calaveras Reservoir could alter the operation of San Antonio Reservoir and result in adverse conditions for the adfluvial trout population in San Antonio Reservoir. DFG recommends that impacts to fisheries upstream and downstream of San Antonio Reservoir be avoided as much as possible. If avoidance is not possible, impacts should be minimized and mitigated.
6. A mitigation plan that assesses the potential impacts of the SFPUC's proposal to rebuild Calaveras Dam with a wider core that would accommodate enlargement of the dam in the future. The NOP states that although the "SFPUC does not reasonably foresee the need for a larger dam beyond one that restores the reservoir's historic capacity; the dam would be designed to allow potential future reuse of dam components without requiring otherwise more extensive dam removal and rebuilding if an enlargement were ever undertaken in the future." DFG recommends that the Calaveras Reservoir dam not be built to accommodate future size increases based on DFG's concern that future increases of the dam's surface water elevation could potentially extirpate the adfluvial population of steelhead trout as well as that of the foothill yellow-legged frogs. Raising the surface water elevation will likely also have serious impacts to

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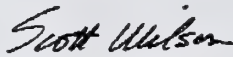
the California red-legged frog, CTS, foothill yellow-legged frog, western pond turtle, Alameda whipsnake, Callope silverspot butterfly, and a number of other special status plants and animals.

7. A specific plan to screen as per DFG screening criteria at the new intake tower/adit(s) at Calaveras Reservoir and at the intake of the diversion at the Alameda Creek Diversion Dam so as to be in compliance with Fish and Game Code Section 6100.
8. A specific plan to provide fish passage at the new Calaveras Reservoir dam and the Alameda Creek Diversion Dam so as to be in compliance with Fish and Game Code Sections 5901.

This Project will result in changes to fish and wildlife resources as described in Title 14, California Code of Regulations (14 CCR), Section 753.5(d)(1)(A)-(G)2. Therefore an environmental filing fee as required under Fish and Game Code Section 711.4(d) should be paid to the San Francisco County Clerk on or before filing of the Notice of Determination for this Project.

We appreciate your consideration of our comments. DFG personnel are available for consultation regarding resources and strategies to minimize impacts. If you have questions regarding fisheries, please contact Kristine Atkinson, Fisheries Biologist, at (831) 427-2638. If you have any questions regarding the CEQA process, please contact Marcia Grefsrud, Environmental Scientist, at (707) 944-5559; or Scott Wilson, Habitat Conservation Supervisor, at (707) 944-5584.

Sincerely,


Robert W. Floerke
Regional Manager
Central Coast Region

cc: See next page

² <http://ccr.oal.ca.gov/>. Find California Code of Regulations, Title 14 Natural Resources, Division 1, Section 753

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Ms. Diana Sokolove
November 22, 2005
Page 8

cc: Mr. Gary Stern
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Santa Rosa, CA 95404

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U. S. Fish and Wildlife Service
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Regulatory Branch
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San Francisco Public Utilities Commission
Planning Bureau
1145 Market Street, Suite 401
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Mr. Josh Milstein
City and County of San Francisco
1390 Market Street, Suite 418
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CEMAR
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Ms. Katie Perry
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State Clearinghouse
Post Office Box 3044
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- Nielsen, J. 2003. *Population Genetic Structure of Alameda Creek Rainbow/Steelhead Trout – 2002*. U. S. Geological Survey, Alaska Science Center, Anchorage, Alaska.
- San Francisco Public Utilities Commission Water Quality Bureau, 2003. *San Antonio Creek, Indian Creek and Arroyo Hondo Fish Trapping Data Summary (2003)*.

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City & County of S.F.
Dept. of City Planning

Letter No. 10

NOV 29 2005

OFFICE OF
ENVIRONMENTAL REVIEW38088 Canyon Heights Dr.
Fremont, CA 94536
November 23, 2005Mr. Paul Meltzer
San Francisco Planning Department
WSIP Environmental Review
30 Van Ness Ave., Suite 4150
San Francisco, CA 94103**SFPUC Calaveras Dam Replacement Project**

Dear Mr. Meltzer:

I attended the scoping session held in Fremont on the 14th of this month and made verbal comments.

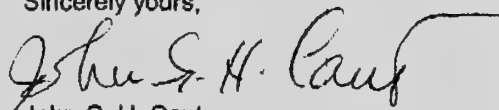
The dam replacement as it has been proposed deals with the problem of the present seismically unsafe structure. It does not, however, tackle the environmental impacts of the present dam nor the impacts that the construction of a new dam will inevitably cause. I believe the SFPUC needs to release sufficient water from the Calaveras reservoir to support all native fish downstream, both resident and migratory. The Alameda Diversion Dam should either be removed (the preferable alternative), or fitted with a mechanism for passage of fish around it. Fish passage measures for the Calaveras dam are even more important.

I urge the Commission to conduct comprehensive surveys for endangered and threatened species in and around the construction sites for the dam replacement, and to ensure that populations of endangered and threatened animals and plants be protected insofar as possible.

In short, the SFPUC appears to be treating the Calaveras Dam Replacement simply as a construction project, whereas I and other environmentally concerned individuals feel that it should encompass preservation of plant and animal communities.

I recommend that the SFPUC take the lead in water conservation and recycling, initiating strong measures in the City of San Francisco and requiring clients which buy water, such as the ACWD, to do likewise. In other words, the Commission should re-conceptualize its mission from simply taking water from other locations to supply the Bay Area, to include protecting the environment by developing modern, feasible programs of water conservation and recycling in the areas it serves.

Sincerely yours,


John G. H. Cant

12/14/2005 17:25 4152741820

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Letter No. 11



Development and Environmental Services Department
 Planning
 39550 Liberty Street, P.O. Box 5008, Fremont, CA 94537-5008
 www.fremont.gov

City & County of S.F.
 Dept. of City Planning

November 30, 2005

DEC 05 2005

OFFICE OF
 ENVIRONMENTAL REVIEW

Diana Sokolove
 Calaveras Environmental Review
 San Francisco Planning Department
 30 Van Ness Ave, Suite 4150
 San Francisco, CA 94103

SUBJECT: Calaveras Dam Replacement EIR - Public Comments

Dear Ms. Sokolove:

Thank you for the opportunity to provide comments on the scoping of the Draft Environmental Impact Report for the Calaveras Dam Replacement Project.

Our comment is that the EIR for the Calaveras Dam Replacement Project should address impacts to Niles Canyon in particular, and Fremont generally, in the event of the failure of Calaveras Dam or the release of a large volume of water. Historically, Alameda Creek has been the major source of flooding in Fremont. We would like the EIR to address the timing and inundation area for flood waters to reach Niles Canyon and then spread into the more populated areas of Fremont. Additionally, the EIR should appropriately evaluate the cumulative impacts to the City of Fremont.

Thank you again for the opportunity to provide these comments. We look forward to your responses and continued update of your progress with the project. If you have any questions regarding these comments, please call me at (510) 494-4451.

Sincerely,

Barbara Meerjans
 Senior Planner



Building & Safety | Engineering | Environmental Services | Planning
 510 494-4400 | 510 494-4700 | 510 494-4740 | 510 494-4440

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TELEPHONE 01:21 0037/01/77

Letter No. 12

FOSCTrails@aol.com
To 11/16/2005 09:52
diana.sokolove@sfgov.org
Subject Alameda Creek

I am a supporter of creek rehabilitation in the Bay Area, and want to make sure that the Calaveras Dam Replacement Project supports the restoration and fish in Alameda Creek below the dam. It is important that the project provides adequate water releases throughout the year to support the fish.

In addition fish passage around the dam for migratory fish is necessary. Removal of the Alameda Diversion Dam would also provide support of these fish populations. As this project is evaluated and planned, please make sure to protect the resources in Alameda Creek.

Sincerely,
Eleanor Dunn, DVM, Dip ABVP
Friends of Sausal Creek volunteer

12/14/2005 17:25 4152741820

PAGE 07

Letter No. 13

EAST BAY REGIONAL PARK DISTRICT

City & County of S.F.
Dept. of City Planning

November 9, 2005

DEC 02 2005

Mr. Paul Maltzer
San Francisco Planning Department
30 Van Ness Suite 4150
San Francisco, CA 94103OFFICE OF
ENVIRONMENTAL REVIEWSubject: Scoping Comments for SFPUC Calaveras Dam Replacement
Sunol/Ohlone Regional Wilderness

Dear Mr. Maltzer,

Thank you for providing the East Bay Regional Park District ("District") with a copy of the Notice of Preparation (NOP) for a Draft Environmental Impact Report (DEIR) for SFPUC's Calaveras Dam Replacement Project. On October 12, 2005, the District provided scoping comments on SFPUC's Water System Improvement Program. Those comments dealt with more general programmatic comments on the proposed Program. The following comments focus more specifically on the proposal to replace the Calaveras Dam in southern Alameda County. One item that is not clear in the NOP is whether a joint EIR/EIS will be prepared, or whether the CPUC and Corps of Engineers will be preparing separate environmental documents. Our comments are being provided for consideration under both the California Environmental Quality Act and the National Environmental Policy Act.

The District leases 3812 acres of land from SFPUC as part of Sunol and Ohlone Regional Wilderness parks. The proposed project has the potential for significant adverse effects to Sunol Regional Wilderness, Ohlone Regional Wilderness, Mission Peak Regional Preserve and Camp Ohlone. The EIR and EIS should evaluate potential effects to all of these regional parks and provide appropriate mitigation for such effects. These effects could include:

1. **Fisheries:** The NOP notes that there may be downstream effects to fisheries from the proposed project. This could include impacts to native fisheries in Alameda Creek at Sunol Regional Wilderness. In cooperation with the SFPUC, the District has imposed a number of restrictions to protect water quality and fisheries in the creek, including restricting livestock, public access and dogs from entering the creek. Such potential impacts, however, do not compare to the potential impacts to fisheries resulting from replacement of the Calaveras Dam. This could include increased sedimentation or erosion, increased turbidity, changes in water chemistry, reduced dissolved oxygen, increased or fluctuating water temperature and creation of new barriers to fish passage.

The EIR and EIS should identify downstream impacts to Alameda Creek and implement measures to mitigate the individual and cumulative effect of successive water diversion

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PAGE 06/11

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and storage projects on this creek. Such measures could include acquisition and protection of additional watershed areas, restoration of degraded riparian vegetation, removal of obsolete water diversion structures and removal of barriers to fish passage. Development of such mitigation measures should be done with the involvement of adjacent property owners and land managers who will be affected by the proposed project.

2. **Plants and Wildlife:** The NOP does not appear to provide any information of the loss or plant and animal habitats in the project area. This would include the footprint of the new dam, stockpile, spoilage, borrow areas and new roads. Figures 3 and 4 depict a large area of impact, potentially including several hundred acres of grassland, scrub, chaparral, oak woodland, coniferous forest, riparian woodland and freshwater wetlands. Many of these habitats are rapidly declining in California and impacts to such communities would be considered significant under CEQA. In addition, the project footprint will create islands of remaining habitat which will have a large edge interface with disturbed areas. Such isolated pockets of habitat will cease to have value for many species that require large contiguous blocks of habitat for foraging, reproduction and migration. As a result, these pockets of habitat should also be considered as impacted by the proposed project. The EIR and EIS must identify and fully mitigate such significant effects.
3. **Special-Status Species:** There is a long list of potentially affected special-status species included in the NOP that may be affected by the proposed project. Of particular interest to the District are native fisheries, such as (anadromous and land-locked) salmonids and squawfish in Alameda Creek, and amphibians and reptiles in the surrounding watershed areas, including California red-legged frog, foothill yellow-legged frog, California tiger salamander, Western pond turtle, horned lizard and Alameda whipsnake.

The upper Alameda Creek Watershed contains large populations of special-status fisheries, amphibians and reptiles that will be impacted by the proposed project. The EIR and EIS should identify impacts to these species and implement measures to mitigate the individual and cumulative effect of successive water diversion and storage projects in this watershed. Such measures could include acquisition and protection of additional watershed areas, restoration of degraded habitats and removal of non-native pigs, foxes, bullfrogs and fish.

Another area of concern is impacts to raptors. There are number of nesting locations for golden eagle, peregrine falcon, prairie falcon and others that may be directly affected by removal of nest locations or indirectly affected by construction disturbance during nesting periods. Other raptors, such as bald eagle forage in Calaveras Reservoir and other nearby reservoirs. Changes in reservoir operations resulting in degradation of reservoir fisheries may impact bald eagle foraging.

The NOP did not identify a number of special-status plants that have been documented in the upper Alameda Creek Watershed that may be impacted by the proposed project. These include *Lesqueria hololeuca* (documented at Calaveras Dam), *L. ianulis* (at Arroyo Mocho), *Hallanthella castanea* (at various locations), *Acanthomintha lanceolata* (at

Sunol), *Campanula exigua* (at Sunol), *Eriophyllum jepsonii* (at Del Valle and Sunol), *Linanthus ambiguus* (at Sunol) and *Monardella villosa* ssp. *globosa* (at Sunol).

4. **Water Quality:** As described above under the fisheries section, the proposed project may result in similar significant impacts to water quality in downstream areas of Alameda Creek in Sunol Regional Wilderness. The EIR and EIS should identify downstream impacts to Alameda Creek and implement measures to mitigate the impacts to water quality.
5. **Air Quality:** Construction of the new dam will impact air quality in the greater project area. Specifically, excavation and transportation of fill materials to the dam site, stock pile, spoilage and borrow sites will result in significant increases in particulates and exhaust from construction equipment and trucks. In addition, project traffic on Calaveras Road; Welch Creek Road (if Apperson Quarry is used) and on unpaved roads in the watershed will generate significant amounts of air pollutants (and water pollutants where particulates would be deposited in drainages). Areas within the air basin which are downwind (or downstream) of construction areas will be impacted by such pollutants, potentially including Sunol Regional Wilderness, Camp Ohlone and other parklands.
6. **Noise:** Similar to air quality impacts, the proposed project will generate significant amounts of noise during the construction of the new dam, excavation or disposal of fill materials and transportation of materials on public roadways and unpaved roads in the watershed. Potential blasting at the dam site or borrow sites may also disrupt wildlife and the recreating public. Such activities should be prohibited on weekends and during high use periods at Sunol Regional Wilderness.
7. **Esthetics:** It appears from the proposed project description that none of the existing material within the existing Calaveras Dam will be utilized for the construction of the new dam. Instead, the proposed project calls for the importation of 2.4 million cubic yards of material to construct the new dam. At least three of the proposed borrow sites are located north of the existing dam, in very close proximity to Sunol Regional Wilderness. One borrow site calls for removing the top of a 1000 foot ridge that is visually prominent from the Wilderness Park. Such impacts are not consistent with the wilderness character of the park and would result in significant and potentially unmitigatable visual impacts to park users. The EIR and EIS should perform a visual impact analysis including visual simulations of before and after project conditions, as seen from public roads, trails and parklands. The EIR and EIS should also consider a range of potential sources for the imported fill materials, including alternative sites that will not result in impacts to Sunol Regional Wilderness.
8. **Recreation:** A number of existing recreational activities take place within the watershed area that may be affected by the proposed project. These include hiking, equestrian, bicycling, picnicking, camping, backpacking, fishing, photography, interpretive programs, nature study and quiet enjoyment in a wilderness area. Some of these activities would be particularly vulnerable to impacts from the proposed project. For

example, night time construction, blasting or truck noise would impact campers and backpackers at Sunol and Camp Ohlone. Closure of roads and trails would impact hikers, equestrians and bicyclists (where permitted).

9. **Traffic and Circulation:** The proposed closure of Calaveras Road between Geary Road and Felter Road would cut off public access to Sunol Regional Wilderness from Santa Clara County and could disrupt public access to the Ohlone Wilderness Regional Trail at its Geary Road crossing of Calaveras Road. Closure of portions of Calaveras road will increase traffic on the northern portions of the road, creating congestion and potentially substantial delays in accessing Sunol Regional Wilderness. The EIR and EIS must identify and fully mitigate such significant effects.

The NOP is silent on the issue of whether materials from the Apperson Quarry may be necessary for construction of the new Calaveras Dam. Opening of this quarry site would result in a number of new impacts to Sunol Regional Wilderness. One of our primary areas of concern with use of the Apperson Quarry would be the traffic and circulation impacts to Sunol from trucking aggregate materials on Calaveras Road, Welch Creek Road, or potentially even through Sunol to reach the new dam location. The EIR and EIS must identify and fully mitigate such significant effects.

10. **Public Safety.** While the NOP states that Calaveras Road would be open to emergency vehicles, its closure to the public would decrease the safety of private vehicles by placing more cars on Calaveras Road north of the closure. More cars on a narrow road increase the chances of collision or vehicles running off the road. Furthermore, large construction vehicles accessing the construction area from Calaveras Road would greatly increase the risk of collision between construction vehicles and private vehicles. The EIR and EIS must identify and fully mitigate such significant effects.

Please call me if you have any questions regarding our scoping letter. I can be reached at (510) 544-2622. Please include my name on any future mailings regarding this project.

Sincerely,



Brad Olson
Environmental Programs Manager

cc. Robert Smith, US Army Corps of Engineers
Tim Ramirez, SFPLC

Letter No. 14

SCOPING MEETING – WRITTEN COMMENTS

**San Francisco Planning Department
Environmental Impact Report on the SFPUC's
Proposed Calaveras Dam Replacement Project**



Thank you for participating in this evening's scoping meeting on the San Francisco Public Utilities Commission's proposed Calaveras Dam Replacement Project. Please provide your written comments about the scope and focus of issues to be addressed in the Environmental Impact Report for the proposed project.

Written comments will be accepted through the close of business on November 30, 2005. Comments may be submitted in one of three ways:

1. Leave your comment sheet in designated "Comment Box" tonight;
2. Mail your comments by November 30, 2005 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, Calaveras Dam Replacement Project EIR, 30 Van Ness Avenue, Suite 4150, San Francisco, CA 94102; or
3. E-mail written comments by November 30, 2005 to diana.sokolove@sfgov.org.

YOUR CONTACT INFORMATION

Name: David K Garges
 Affiliation: ACAW
 Address: 450 Monaco Ave
 City, State, Zip: Union City Ca 94587
 Phone or Email: (510) 471-9000

DGarges@yahoo.com

WRITTEN COMMENTS (Please write clearly and use back side or multiple sheets if necessary)

1. SFPUC needs to Allow Steel head to be Restored to their Pre 1950 State and Quantity.
 - a. Adequate Passage
 - b. " Water Flow
 - c. Recognition That The
 - d. Steel head is Needing to be Restored.
 - e.

PAGE 03

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Letter No. 15

Sherman Lewis <slewis@csuhayward.edu>
To diana.sokolove@sfgov.org
12/01/2005 11:20 AM
Subject Comments on Calaveras Dam Replacement

Comments on Calaveras Dam Replacement

The Hayward Area Planning Association supports the efforts of the ACA to have the PUC consider avoiding impacts to habitat which supports listed species mitigating unavoidable impacts with substantial and meaningful investments that balance the loss building passages for upstream and downstream migration of steelhead trout at Calaveras Dam and Alameda Diversion Dam guaranteeing stream flows to meet the Commission's legal responsibilities to protect native fish and wildlife assuring conditions for the spawning and rearing of steelhead trout restoring the ecosystem below Calaveras Dam and the Alameda Diversion Dam not building a rubber dam in Sunol Valley and building and operating Calaveras reservoir to protect trout.

Sherman Lewis, Chair, Hayward Area Planning Association
2787 Hillcrest Ave., Hayward CA 94542
510-538-3692; slewis@csuhayward.edu; <http://hapa-ca.org/>

Letter No. 16

"Carlyle Holmes" <carlyle@syrcd.org>

To <diana.sokolove@sfgov.org>
10/27/2005 12:05

Subject Public Comment on the SFPUC Calaveras Dam Replacement Project

Paul Maltzer
Environmental Review Officer
Calaveras EIR
30 Van Ness Avenue Suite 4150
San Francisco, CA 94103

Dear Mr Maltzer,

As a supporter of the Alameda Creek Alliance, I am writing to express my support for your proposal to remove Niles and Sunol Dams from Niles Canyon. These removals, in concert with other fish passage projects in the lower creek already funded or in the planning stages, will help steelhead trout and salmon migration up Alameda Creek to Sunol Wilderness.

However, I would like to express my concern about the SFPUC Calaveras Dam Replacement Project. This dam replacement project represents a unique opportunity to take steps to restore our salmonid resources. However, this project does not take advantage of this opportunity--treating the project as an engineering project with no restoration component.

This proposal needs to be rewritten to include restoration actions such as ensuring adequate flows downstream of the dam for migratory fish (not just resident trout), the re-operation or removal of the Alameda Diversion Dam, surveys for endangered and threatened species around the construction sites, and provisions for keeping construction roads and dirt fill areas away from important habitat areas. The project should also include facilities and hardware that allows for stream restoration downstream, including release of the full range of needed stream flows and downstream transport of spawning gravels; adequate fish screens should also be installed at water intakes to protect reservoir fish.

Please help us take advantage of this opportunity to ensure restoration of our anadromous fisheries--they are a resource for our entire state. Thank you.

Sincerley,
Carlyle Holmes

Carlyle Holmes
15454 Wet Hill Rd.
Nevada City, CA 95959

Letter No. 17

"Kevin P. Laird" <kpl@kevinlaird.com>
To sokolove@sfgov.org
11/08/2005 11:54 AM
Subject: Calaveras Dam Replacement Project

I cannot attend the public meeting regarding this important matter and am deeply concerned that an opportunity to correct the environmentally irresponsible actions of the past will be ignored. I live near the Alameda Creek in Fremont and like many residents of the area I enjoy biking along the creek regularly. I, and many of my friends and neighbors, and many people from all over the Bay Area also visit Coyote Hills and the Sunol Wilderness through which Alameda Creek passes through. It truly would be amazing to see Salmon make their migration runs up this creek wouldn't it? When is another opportunity like this going to come along? The dam replacement project must include restoration of the habitat destroyed when the original dam was built. The current releases of water from the dam also need to be suitable for migratory fish. The Alameda Diversion dam must also be removed or improved so that it does not block fish migration. It's bad enough that the current dam has been allowed to operate in violation of state laws for so long. Please take this opportunity to correct this situation for future generation.

Thank you,
Kevin Laird
34736 Beret Terrace
Fremont, CA
510-793-0225

Letter No. 18



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

Southwest Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404

In response refer to:
151422SWR05SR00796:GRS

November 30, 2005

Paul Maltzer
Environmental Review Officer, Calaveras EIR
San Francisco Planning Department
30 Van Ness Avenue, Suite 4150
San Francisco, California 94103

Dear Mr. Maltzer:

Thank you for the opportunity to comment on the Notice of Preparation (NOP) for the San Francisco Public Utilities Commission's (SFPUC) Calaveras Dam Replacement Project Environmental Impact Report (EIR). The SFPUC is proposing to replace the existing Calaveras Dam by constructing a new dam of equivalent height and storage at the downstream edge of the existing structure. For seismic safety purposes and improved operations and maintenance, the replacement dam would include a new intake tower, as well as a new outlet valve for water release necessary for environmental purposes.

NOAA's National Marine Fisheries Service (NMFS) staff have reviewed the Notice of Preparation dated October 24, 2005, and have been working directly with SFPUC staff on this project, as well as other SFPUC projects in the upper Alameda Creek watershed. NMFS offers the following comments on the proposed scope and content of the project's EIR.

The existing rainbow trout (*Oncorhynchus mykiss*) population in Calaveras Reservoir is unique and important in that they exhibit an adfluvial life history and appear to be genetically similar to threatened Central California Coast steelhead. Nielson (2003) examined mitochondrial DNA and microsatellite loci of *O. mykiss* from upper Alameda Creek and found that this population was similar to populations from other creeks within the Central California Coast steelhead Evolutionarily Significant Unit (ESU)¹. Based on this genetic information and other characteristics, NMFS considers the upper Alameda Creek population of *O. mykiss* to be part of the Central California Coast steelhead ESU, although they are not listed under the Endangered Species Act. The project's construction and operation should be designed to ensure the protection and conservation of this important rainbow trout population.

¹ Nielson, J.L. 2003. Population Genetic Structure of Alameda Creek Rainbow/Steelhead Trout - 2002. U.S. Geological Survey, Alaska Science Center. 18 pp.



Through the Alameda Creek Fisheries Restoration Workgroup, NMFS, SFPUC and others have been actively working to restore an anadromous run of steelhead in the watershed. Efforts to remedy existing fish barriers are moving forward and it is likely that access for an anadromous run will be restored to upper Alameda Creek concurrent with the construction of this project. Thus, it is important that this project be constructed and operated in a manner consistent with the protection and conservation of threatened Central California Coast steelhead. The NOP's project description specifies water release amounts up to 6,300 acre feet will be provided to Calaveras and Alameda creeks. NMFS is concerned that the proposed release amount of up to 6,300 acre feet may not be sufficient to provide for the year-round life history requirements of steelhead below Calaveras Dam. Water release amounts considered in the EIR should be based on flow-habitat relationships developed through biologically sound methods. NMFS recommends a range of water releases be considered in the EIR which provide for steelhead, spawning, incubation, rearing and migration below the dam. In addition to bypass flows, the EIR should consider the installation of fish passage facilities at the new Calaveras Dam to provide for the upstream and downstream passage of steelhead adults and smolts.

The NOP briefly mentions the Alameda Creek Diversion Dam and tunnel which are used to divert flows from upper Alameda Creek into the existing Calaveras Reservoir. These facilities should be addressed in the EIR if they are used to diverted flow into the restored reservoir behind the new Calaveras Dam. Fish protection measures that should be considered for the Alameda Creek Diversion Dam include a fish screen to prevent entrainment into the tunnel, a fish ladder for adult upstream passage, safe facilities for the downstream passage of adult and juvenile fish, and bypass flows to protect aquatic life below the point of diversion.

The NOP states the Army Corps of Engineers (Corps) will prepare an environmental document for compliance with the National Environmental Policy Act (NEPA), although the Corps has not determined if the NEPA document will be an environmental assessment (EA) or an environmental impact statement (EIS). To assist the Corps in this determination, NMFS offers the following information. The operation of the new Calaveras Dam will significantly affect efforts to restore steelhead in the Alameda Creek watershed. The seven to eight mile reach of Alameda Creek immediately below the new Calaveras Dam offers the greatest potential in the watershed for the restoration of steelhead, because this reach will soon become accessible to anadromous fish and the area offers abundant clean gravels and a well-developed riparian corridor. However, the amount and timing of flow releases from the new Calaveras Dam will define the suitability of this area for fish and significantly affect the steelhead restoration program's ability to re-establish an anadromous population in the watershed.

If you have questions concerning these comments, please contact Mr. Gary Stern of my staff at 707-575-6060.

Sincerely,

A handwritten signature in black ink, appearing to read "Dick Butler", with a long horizontal flourish extending to the right.

Dick Butler
Santa Rosa Area Office Supervisor
Protected Resources Division

cc: Russ Strach, NMFS, Sacramento
Kristine Atkinson, DFG Santa Cruz
Bob Smith, Corps San Francisco District
Sheila Larson, FWS Sacramento

Letter No. 19

"K. Ohlson" <kaohlson@yahoo.com>
To diana.sokolove@sfgov.org
11/15/2005 06:06 PM
Subject: Assure viability for trout in Alameda Creek re Calaveras Dam Project

Dear Paul Maltzer
Environmental Review Office

I am writing to strongly urge that for the Calaveras Dam Replacement Project, you assure that:

1. there are adequate water releases from Calaveras Reservoir to restore steelhead trout in Alameda Creek below the dam,
2. fish passage for migratory fish past the new dam, and
3. removal of the Alameda Diversion Dam.

Please, as steward of our natural resources, do the right thing for wildlife habitat. I am a long time East Bay resident and admirer of riparian areas. It is our moral obligation to share earth's resources with other life forms.

Thank you, Kristin Ohlson
1624 Leimert Bl
Oakland, Ca 94602

Letter No. 20

Jim Prola <jimprola@yahoo.com>
To Diana Sokolove <diana.sokolove@sfgov.org>
11/16/2005 05:01 PM
Subject Calaveras Dam Replacement Project DEIR

Dear Diana, please pass this on

The dam replacement project is proposed and described purely as an engineering project, without a restoration component. The existing dam is operated in violation of state environmental laws and the rebuilt dam will continue to impact migratory and resident fish downstream of the dam. The SFPUC cannot undertake a major infrastructure project like this without including restoration measures.

The project needs to include minimum water releases from Calaveras adequate to support all native fish downstream, including steelhead trout. The 6,300 acre-feet of water mentioned in the project description is misleading and was intended for enhancing limited habitat for resident trout, not for migratory fish. The actual amount of water SFPUC would release would be much lower, as the proposed project would allow natural stream flow to meet most of this flow requirement.

The project needs to include removal or re-operation of the Alameda Diversion Dam, which diverts most of the flows of upper Alameda Creek and blocks fish migration.

The project needs comprehensive surveys for endangered and threatened species around the construction sites. Numerous listed species, such as red-legged and yellow-legged frog, tiger salamander, and Alameda whipsnake live around the reservoir.

The proposed construction roads and borrow and disposal areas for dirt fill need to avoid habitat for listed and sensitive species.

The project must include facilities and hardware that allows for stream restoration downstream, including release of the full range of needed stream flows and downstream transport of spawning gravels; adequate fish screens should also be installed at water intakes to protect reservoir fish.

Jim, Diana, and Ken Prola
2234 Belvedere Ave
San Leandro, Ca. 94577
510-483-0744

Letter No. 21

"Todd M. Ravazza" <ravazzat@yahoo.com>
 To diana.sokolove@sfgov.org
 10/27/2005 03:54

Subject Calaveras Dam EIR Comments
 Please respond to ravazzat@yahoo.com

I have serious concerns and issues surrounding the Calaveras dam project. They are as follows:

1. The dam replacement project appears to only be an engineering project, with no creek/water flow/wildlife restoration component.
2. The existing dam has been operating in violation of state environmental laws and the rebuilt dam will continue to have an impact on migratory and resident fish downstream of the dam. The SFPUC cannot undertake a major infrastructure project like this without including restoration measures.
3. The project must include minimum water releases from Calaveras adequate to support all native fish downstream, including steelhead trout. The 6,300 acre-feet of water mentioned in the project description is misleading and was intended for enhancing limited habitat for resident trout, not for migratory fish such as steelhead and salmon. The actual amount of water SFPUC would release would be much lower, as the proposed project would allow natural stream flow to meet most of this flow requirement.
4. The project needs to include removal of the Alameda Diversion Dam that diverts most of the flows of upper Alameda Creek and blocks fish migration.
5. The project needs comprehensive surveys of and for endangered and threatened species around the construction sites. Numerous listed species, such as red-legged and yellow-legged frog, tiger salamander, and Alameda whipsnake live around the reservoir.
 - a. The proposed construction roads and borrow and disposal areas for dirt fill need to avoid habitat for listed and sensitive species.
6. The project must include facilities and hardware that allows for stream restoration downstream, including release of the full range of needed stream flows and downstream transport of spawning gravels; adequate fish screens should also be installed at water intakes to protect reservoir fish.

There have been numerous successful projects like this done in Southern California. For the sake of our environment and our children's rights to enjoy these things

IF SOUTHERN CALIFORNIA CAN DO THIS WHY CAN'T WE DO THESE AS WELL IN THE BAY AREA???

I AND MY FAMILY AND CHILDREN TRULY CARE ABOUT THESE THINGS AND WANT TO SEE THESE RESTORED!

I BEG OF YOU TO PLEASE CONSIDER THE LONG TERM EFFECTS ON OUR ECO-CULTURE AND ITS LASTING IMPACTS ON OUR SOCIETY! MANY OF THESE THINGS WILL REMAIN DAMAGED OR LOST FOREVER.

Todd M. Ravazza
 Dublin Resident and Registered Voter

Letter No. 22

Paul Maltzer
Environmental Review Officer, WSIP PEIR
San Francisco Planning Department
30 Van Ness Avenue, Suite 4150
San Francisco, CA 94103

Dear Mr. Maltzer and Ms. Sokolove:

**Scoping Input from Restore Hetch Hetchy, P O Box 3538,
Sonora CA 95370
Ron Good, Executive Director, 415-987-9944
November 30, 2005**

Scoping Input for EIR on SFPUC CALAVERAS DAM REPLACEMENT

We understand that impacts you must considered are to be based on present conditions, which would be for the Calaveras Reservoir at 37,800 af. That is, mitigation is required for increasing the dam and reservoir to 98,000 af.

What are the regional reliability benefits to the service area of having this reservoir be larger than 98,000 af? What are the impacts and mitigation costs of having such a larger reservoir?

What are rough outline of the regional reliability benefits to the service area, rough impacts and cost of mitigations for increasing the reservoir to the full of 600,000 af envisioned in the CIP at the time the people voted?

Likewise, what are the rough outline of regional reliability benefits to the service area, rough impacts and costs of mitigation for an increased reservoir built to the maximum size that now is considered to be earthquake safe?

How much would enlargement of Calaveras Reservoir above 98,000 acre-feet aid water supply protection?

How would raising the reservoir above present 37,500 af size impact Native American sites and other cultural and historic sites?

How would raising the reservoir capacity above 98,000 af impact Native American sites and historical sites?

How does cattle grazing on SF owned land in the Calaveras and Alameda creek watersheds impact water quality and treatment costs at SVWTP? Is there another way of removing excess wildfire fuels from this watershed that would improve water quality?

List and explain why all stream release requirements that are not being met on Alameda Creek and other streams in this watershed.

Explain all SF existing water rights in the Alameda Creek watershed and explain SF diversions from this watershed in light of these water rights.

How much stream release is needed to support a restored steelhead fishery in Alameda Creek watershed?

What structure changes are needed to support steelhead in the Alameda Creek watershed, e.g. what physical or social barriers need to be removed? What would be the cost of removing those barriers to free movement of migrating steelhead in this watershed?

Discuss the impacts of present and each possible enlarged Calaveras Reservoir on steelhead in Alameda Creek and its tributaries.

What are the dam construction impacts on steelhead and other trout now in Calaveras Reservoir and in Alameda and Calaveras creeks?

What are the construction impacts of elimination of barriers to Alameda Creek landlocked steelhead migration?

What are the impacts on Alameda Creek by its diversion into Calaveras Reservoir? What are the mitigations for this? What are the impacts of eliminating the Alameda Creek diversion or providing a fish passage?

What areas are at risk to people of flood presently below existing Calaveras Reservoir, a replaced Calaveras Reservoir and a Calaveras Reservoir larger than 98,000 acre-feet?

Can construction and/or operation of an replacement Calaveras Dam affect local groundwater resources in Alameda and Santa Clara counties?

Would this project cause interference with movement of native or migratory fish species in Alameda Creek?

An alternative should include an option with Calaveras Reservoir being more than 98,000 af, and with a pumping plant to move aqueduct water into that larger reservoir with energy recovery turbines (reversible pumps) when water is withdrawn from the reservoir.

In the SFPUC Purchase Estimates and Water Supply Options, Revised Draft, June 28, 2005 all the graphs are shown on a SF fiscal year basis. That is good for accountants and the Board of Supervisors, but is not logical for others reading an EIR. We ask that all planning, graphs, water balances and tables be based on a water year basis, Oct 1 through Sept 30 which is the most logical presentation to understand flow data. Presenting fiscal year tables could also be done for those who need them.

Explain how expansion of Calaveras to 98,000 af and above 98,000 af can reduce the service area vulnerability to loss of service by earthquakes occurring east of Alameda Creek.

Restore Hetch Hetchy will be glad to send the Planning Department our 2005 report Finding the Way Back to Hetch Valley, A vision of steps to restore Hetch Hetchy Valley in Yosemite National Park and to replace water and energy supplies for use in preparing the EIR.

12/06/2005 18:07 4152741820

Letter No. 23



SAN FRANCISCO
ARCHITECTURAL
HERITAGE

November 17, 2005

City & County of S.F.
Dept. of City Planning

NOV 22 2005

OFFICE OF
ENVIRONMENTAL REVIEW

Mr. Paul Maltzer, Environmental Review Officer
Planning Department
City & County of San Francisco
1660 Mission Street, 5th fl.
San Francisco, CA 94103-2414

Re: Calaveras Dam Replacement Project

Dear Mr. Maltzer:

San Francisco Architectural Heritage would like to comment on the environmental review for the Calaveras Dam Replacement Project.

It is our understanding that this project has the potential to impact cultural resources during construction. Heritage would request this possibility be explored to the fullest extent of CEQA, this may require a cultural resource survey of the area of potential effect, and that any impacts be minimized through strict mitigation measures as determined by a historic preservation consultant.

On behalf of the more than 1,500 members of San Francisco Architectural Heritage, thank you for the opportunity to comment on the Calaveras Dam Project.

Sincerely,

Charles Edwin Chase, AIA
Executive Director

CEC/s

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Letter No. 24

SCOPING MEETING – WRITTEN COMMENTS

**San Francisco Planning Department
Environmental Impact Report on the SFPUC's
Proposed Calaveras Dam Replacement Project**



Thank you for participating in this evening's scoping meeting on the San Francisco Public Utilities Commission's proposed Calaveras Dam Replacement Project. Please provide your written comments about the scope and focus of issues to be addressed in the Environmental Impact Report for the proposed project.

Written comments will be accepted through the close of business on November 30, 2005. Comments may be submitted in one of three ways:

1. Leave your comment sheet in designated "Comment Box" tonight;
2. Mail your comments by November 30, 2005 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, Calaveras Dam Replacement Project EIR, 30 Van Ness Avenue, Suite 4150, San Francisco, CA 94102; or
3. E-mail written comments by November 30, 2005 to diana.sokolove@sfgov.org.

YOUR CONTACT INFORMATION

Name: AMY FOWLER
 Affiliation: SANTA CLARA VALLEY WATER DISTRICT
 Address: 5750 ALMADEN EXPW
 City, State, Zip: SAN JOSE, CA 95118
 Phone or Email: afowler@valleywater.org

WRITTEN COMMENTS *(Please write clearly and use back side or multiple sheets if necessary)*

- ① Support SFPUC to ensure replacement dam includes design elements to enable future enlargement.
- ② Need to preserve, if not expand, storage in the SFPUC regional water system and in the Bay Area region. More storage is needed for system flexibility, to allow for carry-over of

PAGE 04

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WRITTEN COMMENTS (Continued)

wet period / wet year supplies for dry year needs. Sound management of wet year supplies will minimize competition for precious dry year diminished supplies.

PAGE 05

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Letter No. 25



San Francisco Bay Chapter

Serving the counties of Alameda, Contra Costa, Marin and San Francisco

San Francisco Planning Department

November 30, 2005

Attention: Paul Maltzer

Environmental Review Officer, Calaveras EIR

30 Van Ness Avenue, Suite 4150

San Francisco, CA 94103

RE: Case No. 2005.0161E

Scoping comments for the Calaveras Dam Replacement Project Environmental Impact Report

The Sierra Club supports the SFPUC's efforts to make needed repairs and earthquake safety retrofits to its water system, and to rebuild the Calaveras dam to its current design capacity.

The San Francisco Public Utilities Commission has indicated that the preferred EIR project alternative is to rebuild the dam to the current design capacity of approximately 98,000 acre-feet, but with an enlarged core that will enable the dam to be expanded to approximately 365,000 acre feet. The reason, according the SF PUC, is that while expansion is desirable and may be needed in the future, the SF PUC wishes to keep the project characterized as a "retrofit" rather than an expansion. (Staff mentioned this as recently as November 29, 2005 at the SF PUC commission hearing.)

The Sierra Club believes that this technicality is not a sufficient reason to avoid studying the environmental effects of expansion. The EIR must study the environmental effects of building the dam infrastructure to the capacity that it can be expanded to.

Expanding the dam beyond the current design capacity would do serious environmental damage. Such an expansion could flood thousands of acres of habitat of rare and endangered species in the area that is adjacent to two designated wilderness areas, the Sunol and Ohlone Wilderness Areas. The effect of the loss of this habitat at Calaveras would extend beyond of the boundaries of the SF PUC land holdings and into the adjacent wilderness lands. The EIR must consider these impacts.

In addition, the EIR needs to include the study of the following alternatives:

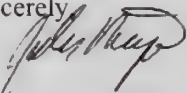
- An alternative without the expanded core; that is, an alternative that does not enable the dam to be expanded beyond the current design capacity.

2520 San Pablo Ave. Suite L Berkeley, CA 94702 Tel: (510) 848-0800 E-Mail: san-francisco-bay.chapter@sierraclub.org

- Alternatives that do not make the changes to the current configuration, such as a new intake tower that is noted in the Notice of Preparation
- A range of alternatives must be included that take different approaches to avoiding impacts to the habit of species in the area.
- Alternatives describing different potential water releases from the SFPUC dams and the effects, positive and negative, and the fish and wildlife. This includes the study of a seasonally based flow regime that improves current conditions of streams.
- Alternatives that restore functioning ecosystems

The EIR also needs to include a project description that is compliant with all of the legal obligations for environmental protection, including those required by Propositions A and E passed by the voters in San Francisco in 2002. These two measures require that the City and County of San Francisco not only follow the requirements of CEQA, but include watershed and environmental improvements, and to promote water conservation and responsible stewardship of its natural resources. The City needs to comply with these guidelines for the Calaveras Dam and the Alameda Diversion Dam projects.

Sincerely,



John Rizzo
Chair, San Francisco Bay Chapter

2530 San Pablo Ave., Suite J, Berkeley, CA 94702 Tel: (510) 848-0800 E-Mail: san-francisco-bay-chapter@sierraclub.org

Letter No. 26

Kenneth G. Snetsinger
 Judith C. Etheridge
 PO Box 62
 Sunol, CA 94586

City & County of S.F.
 Dept. of City Planning

November 15, 2005

NOV 18 2005

Paul Maltzer
 Environmental Review Officer
 Calaveras Dam Replacement Project EIR
 30 Van Ness Avenue, Suite 4150
 San Francisco, CA 94102

OFFICE OF
 ENVIRONMENTAL REVIEW

Dear Mr. Maltzer,

We attended the Calaveras Dam Replacement Scoping meeting on November 14, 2005 and have several questions and observations about the project. We live at 3624 Welch Creek Road just north of the Calaveras Reservoir and use Calaveras Road north of Geary Road. This section of Calaveras Road is mentioned in the Case No. 2005.0161E Notice of Preparation document, the Traffic and Transportation section which states that "would be public safety concern during periods of heavy hauling... which may include large volumes of haul trucks" will occur. What are the safety concerns? Will the EIR state how many and during what hours the haul trucks will be using Calaveras Road. Will local residents be notified when these periods will occur?

The East Bay Regional Park, Sunol Regional Wilderness, is located at the end of Geary Road. Has the East Bay Regional Park District been notified of this project and, if so, are there any plans to ensure continued access to the Wilderness during the construction of the dam?

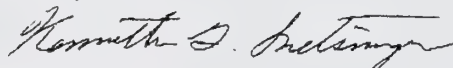
Figure 3 of the Project Draft EIR shows temporary haul roads and areas of potential spoils and borrows around the reservoir. Will habitat for endangered and sensitive species be preserved during the construction? Will site restoration be a part of the Project?

What is the purpose of the Diversion Dam? Does this dam block fish migration?

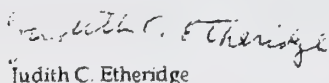
We remind the San Francisco Planning Department that the new dam would be only 3,000 feet east of the Calaveras Fault which, according to the San Jose Sheet of the California Division of Mines and Geology Geologic Map of California, would pass N18 degrees W through the word "Haul" in the "Haul Road Areas" on the lower part of Figure 4 "Dam Construction Area" (dated 10/24/05). Media reports have quoted geologists as noting that movement is overdue of this fault.

We appreciate the opportunity to comment on this Project.

Sincerely,



Kenneth G. Snetsinger



Judith C. Etheridge

PAGE 02

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Letter No. 27

November 23, 2005

City & County of S.F.
Dept. of City Planning

NOV 29 2005

Scott Stevenson
2689 Yerba Cliff Ct.
San Jose, CA 95121OFFICE OF
ENVIRONMENTAL REVIEWSan Francisco Planning Dept.
Attn: Paul Maltzer
Envir. Review Officer, Calaveras EIR
30 Van Ness Ave.
Suite 4150
San Francisco, CA 94103

Dear Mr. Maltzer,

The following are comments on the EIR for the SFPUC Calaveras Dam Replacement Project.

The new project needs to include a restoration component. As it stands, the dam replacement is merely an engineering project and needs to take into effect the impact on migratory and resident fish downstream.

The project needs to include sufficient water releases to support native fish downstream, including steelhead. We have a unique opportunity to restore historic salmon and steelhead runs.

Plans need to include removal or re-operation of the Alameda Diversion Dam, which diverts most of the flows of upper Alameda Creek and blocks fish migration.

The project needs to have plans for passage for migratory fish past Calaveras Dam as well as restore ecosystem function (such as sediment transport) below the dam.

Comprehensive surveys are needed for endangered and threatened species around the construction sites. Proposed construction roads and borrow and disposal areas for dirt fill need to avoid habitat for listed and sensitive species.

The project must include facilities and hardware that allows for stream restoration downstream, including release of the full range of needed stream flows and downstream transport of spawning gravels; adequate fish screens should also be installed at water intakes to protect reservoir fish.

Sincerely,



Letter No. 28



California Regional Office
201 Mission Street Fourth Floor
San Francisco, CA 94105

tel [415] 777-0487
fax [415] 777-0244
[415] 777-0772
nature.org

November 22, 2005

City & County of S.F.
Dept. of City Planning

Mr. Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
30 Van Ness Avenue, Suite 4150
San Francisco, CA 94103

NOV 23 2005

OFFICE OF
ENVIRONMENTAL REVIEW

Re: Scoping comments for the San Francisco Public Utilities Commission's Program
Environmental Impact Report on the Calaveras Dam Replacement Project

Dear Mr. Maltzer,

I appreciate the opportunity to comment on the scoping phase of the Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's (SFPUC) Calaveras Dam Replacement Project. The comments are submitted by The Nature Conservancy (TNC), a global conservation organization with approximately 1 millions members. Locally, TNC is working with federal, state and local partners to protect the unique natural communities and native species of its Mount Hamilton Project, which includes the Alameda Creek Watershed. The Conservancy's interest is in determining the likely impact of the replacement of the Calaveras Dam on valuable natural resources in the tributaries of Alameda Creek and beyond.

This project presents a unique opportunity for SFPUC to address important natural resource issues in this watershed. Below are some of the specific projects and impacts that we hope SFPUC will address in its EIR.

Restoration of Native Fish Runs in the Alameda Creek Watershed

Alameda Creek has the potential to be the finest steelhead stream within the Diablo Range. TNC is working to protect additional habitat for threatened steelhead in the upper reaches of the watershed. As part of the Calaveras Dam replacement project, SFPUC should study the feasibility and benefits of the following enhancements to native fish populations:

- providing fish passage past the rebuilt Calaveras dam both upstream and downstream for fish in Calaveras Creek and Arroyo Hondo
- modification or removal of the Alameda Diversion Dam to provide fish passage to the upper reaches of Alameda Creek
- releasing water from Calaveras Dam to mimic full range of natural flow regimes downstream of the dam in Calaveras and Alameda Creeks

Mitigation for Habitat Degradation or Destruction

As addressed in the Notice of Preparation, there may be unavoidable impacts to sensitive biological resources during the construction phase of this project. While SFPUC should strive to limit these impacts, there is also an opportunity to take the following actions to improve the

PAGE 12

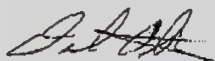
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overall understanding and health of the ecosystems and natural communities in the Alameda Creek Watershed:

- undertaking a comprehensive study of areas that may be impacted by construction for rare or sensitive species
- implementing a construction plan that minimizes impacts to rare or sensitive species
- providing funding for mitigation for unavoidable impacts to rare or sensitive species that includes permanent protection of habitat elsewhere in the Alameda Creek

Thank you for considering our comments. I look forward to working with you more on this project.

Sincerely,



Daniel Olstein
Mount Hamilton Project Manager, The Nature Conservancy

Letter No. 29

Alameda Creek Alliance

PO Box 192 • Canyon, CA • 94516 • (510) 499-9185
 e-mail: alamedacreek@hotmail.com
 web site: <http://www.alamedacreek.org>

October 12, 2005

San Francisco Planning Department
 Attention: Paul Maltzer
 Environmental Review Officer, WSIP PEIR
 30 Van Ness Avenue, Suite 4150
 San Francisco, CA 94103

Re: Scoping comments on WSIP PEIR

These are the comments of the Alameda Creek Alliance (ACA) on the Program Environmental Impact Report (PEIR) for the SFPUC's Water System Improvement Program (WSIP). Recently, 65 Bay Area conservation organizations representing tens of thousands of Bay Area residents sent the SFPUC a letter requesting that the SFPUC take immediate actions to restore Alameda Creek. The WSIP should incorporate these actions into funded projects and the overall program should reflect the public's desire for a just and sustainable water system that protects and restores the watersheds and wildlife habitats under the SFPUC's management.

Conservation and recycling

The ACA supports the SFPUC's efforts to make needed repairs and earthquake safety retrofits to its water system. However, increases in future demand should be met through conservation and water use efficiency projects rather than infrastructure that expands the capacity of the system to withdraw more water from SFPUC watersheds.

Stewardship and restoration actions need to be included

Measures A and E, the legislation authorizing the financing for the WSIP approved by San Francisco voters in November of 2002, made it clear that water conservation, stewardship, and environmental restoration were to be part of the WSIP. Proposition E states; "in planning for its future needs and those of its wholesale customers, the City must promote water conservation and responsible stewardship of its natural resources." Proposition A states that such improvements; "include, but are not limited to, water delivery and seismic improvements, water quality improvements, water supply improvements, and watershed and environmental improvements..."

A major failing of the WSIP is that it does not include stewardship and restoration actions as an integral part of the program, or as specific improvement projects contemplated in the PEIR. The recent Parsons/CH2MHill report to the SFPUC concluded that "activities reflecting the SFPUC's commitment to integrate the Stewardship Policy and Principles into the WSIP have not been made explicit" and have "not been fully applied to the program." The Parsons/CH2MHill report recommended ensuring that the watershed stewardship policy is applied consistently to the program and project-specific scopes. The ACA can only support WSIP projects which both include specific environmental benefits that mitigate for the environmental impacts of the project and fund a restoration and stewardship component of the project.

Watershed and ecosystem restoration, specifically habitat protection and enhancement for the SFPUC watersheds affected by the WSIP (Alameda Creek, the Tuolumne River, and Peninsula

watersheds), should be an explicit part of the program description, goals and objectives. Environmental benefits should be integrated into all WSIP projects involving major facilities or potentially significant environmental impacts. The PEIR for the WSIP should include specific stewardship objectives and timelines, and funding for stewardship and restoration actions in affected ecosystems should be commensurate with past and contemplated environmental impacts from the SFPUC's water supply system. The PEIR should specifically include funding for watershed improvement projects such as land acquisition and habitat restoration.

Stream flows for affected SFPUC watersheds

Three existing SFPUC dams block most of the suitable steelhead trout spawning and rearing habitat in the Alameda Creek watershed. Since the proposed replacement for Calaveras Dam will also block access for anadromous fish into the upper watershed and since the SFPUC diverts over 85% of the natural stream flow of upper Alameda Creek, the PEIR should evaluate the need and potential for increased stream flows below all SFPUC dams and diversions, to restore sufficient instream flows to sustain native fish in good condition. The PEIR description of the need for the WSIP should mention the impact of all existing and planned SFPUC facilities on fish and wildlife habitat. For Alameda Creek, the PEIR should specifically discuss how the SFPUC's dams and diversions contribute to ongoing violations of CA Fish and Game Code 5937, past and present damage to fish habitat and runs, and the potential for future take of federally listed steelhead and rainbow trout. The WSIP should feature projects and funding to improve freshwater flows for affected stream reaches in the Alameda Creek watershed, as well as in the watersheds of Pilarcitos Creek and the Tuolumne River, to support the needs of wildlife and recreation.

Calaveras Dam Replacement and Alameda Creek Fishery Enhancement Project, Project SV-2

Part of the stated purpose and description of this project should be to keep native fish populations (including those downstream of Calaveras Dam and the Alameda Diversion Dam, and in Calaveras Reservoir) in good condition, and to restore habitat for anadromous steelhead trout in Alameda Creek. The project should include:

- increased stream flows from Calaveras Reservoir to benefit resident and steelhead trout below the dam;
- removal or re-operation of the Alameda Diversion Dam from upper Alameda Creek or the dam to provide fish passage; and
- reservoir operations designed to protect the landlocked reservoir trout population in Calaveras Reservoir.

The so-called "Alameda Creek Fishery Enhancement Project" has been incorporated into the Calaveras Dam Replacement Project. This project involves construction of an unneeded rubber water recapture dam in the Sunol Valley, at a cost of \$17.5 million. The proposed recapture facility is not a legitimate enhancement project, as it has no benefit for native fish and wildlife and the facility itself will likely degrade aquatic habitat in Alameda Creek. The minimum flows contemplated for release (6,300 af per year) would be met by natural stream flow in most years, requiring the SFPUC to release little or no flows. These flows would be recaptured and provide no benefit for anadromous fish. A more meaningful flow release schedule should be included as part of the project and will likely be required to correct existing violations of CA Fish and Game Code 5937 and to prevent future take of federally listed trout. The proposed recapture facility should be stricken from the project and should not be built. This project currently includes an attempt to divert more water from Alameda Creek, a blatant water grab that will degrade rather than restore Alameda Creek.

Additional 40 mgd Treated Water Supply, Project SV-3 and Sunol Valley WTP, Project SV-6

These projects would allow the SFPUC to increase the rate and amount of water that could be removed and treated from Calaveras Reservoir. Increased withdrawals from Calaveras Reservoir could obviously have an impact on the reservoir trout population. The new treated water reservoir would have a footprint of over 5 acres, and would likely affect habitat for listed species in the Sunol Valley. The addition of this large reservoir would also increase the risk of chemical spills in Alameda Creek. Mitigations for all environmental impacts should be included in the project.

Alternatives analysis

The PEIR should consider project alternatives that:

- provide greater conservation programs and increased water reclamation rather than expanding the capacity of the water system;
- do not expand the capacity of the water system to withdraw water from the Tuolumne River and Alameda Creek; and
- improve freshwater flows for affected stream reaches in Alameda Creek and other SFPUC watersheds.

Evaluation of environmental impacts

Under 14 California Code of Regulations § 15168(c)(1), the PEIR must discuss all of the environmental impacts of the WSIP. The PEIR must consider the impacts of:

- increasing system capacity on the Alameda Creek watershed, the Tuolumne River watershed, and the Peninsula watershed;
- increased withdrawals from Alameda Creek and the Tuolumne River on aquatic habitat and on water quality;
- the Calaveras Dam replacement on aquatic and terrestrial habitat and listed species above and below the reservoir;
- the proposed Alameda Creek Fisheries Enhancement Project on aquatic habitat and listed species in Alameda Creek; and
- enlarging the capacity of the Sunol Valley Water Treatment Plant on trout habitat in Calaveras Reservoir and on the availability of stream flow in Alameda Creek to meet the needs of wildlife and recreation.

The following studies are needed to evaluate the impacts of WSIP projects on Alameda Creek:

- a restoration plan which determines the flows needed for maintaining native fish in good condition and for restoring steelhead trout habitat in Alameda Creek;
- surveys for presence of endangered species and suitable habitat on all SFPUC lands and streams in the Alameda Creek watershed affected by the WSIP; and
- an assessment of the feasibility and impacts of altering operation of or removing the Alameda Diversion Dam.

Sincerely,

Jeff Miller

Director, Alameda Creek Alliance

Letter No. 30

EAST BAY REGIONAL PARK DISTRICT



City & County of S.F.
Dept. of City Planning

October 12, 2005

Mr. Paul Maltzer
San Francisco Planning Department
30 Van Ness Suite 4150
San Francisco, CA 94103

OCT 19 2005

OFFICE OF
ENVIRONMENTAL REVIEW

Subject: Scoping Comments for SFPUC Water System Improvement Program
Sunol/Ohlone Regional Wilderness

Dear Mr. Maltzer,

Thank you for providing the East Bay Regional Park District ("District") with a copy of the Notice of Preparation (NOP) for a Draft Environmental Impact Report (DEIR) for SFPUC's Water System Improvement Program. The following are the District's scoping comments for your consideration in preparing the DEIR.

The District has a long established cooperative working relationship with the SFPUC on joint management of open space and watershed lands in the East Bay. We are also working with SFPUC and other agencies on watershed planning studies that include restoration of fisheries in Alameda Creek and public access in Niles Canyon.

The District leases 3812 acres of land from SFPUC as part of Sunol and Ohlone Regional Wilderness parks. These leases place a number of restrictions upon these lands, including no water-contact recreation, no bicycles and limitations on dogs and livestock grazing. The proposed project may create expand use restrictions on District-leased watershed lands. We are concerned about our ability to effectively implement such restrictions given current budget constraints and other competing interests. The proposed project description also includes replacement of the Calaveras Dam, which has the potential for significant effects to Sunol Regional Wilderness and other regional parks.

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Pat O'Brien
General Manager

Regional Parks

The District owns or manages 31,462 acres of open space within the middle and upper portions of Alameda Creek Watershed. These include the following regional parks:

• Sunol Regional Wilderness	6858 acres
• Ohlone Regional Wilderness	9736 acres
• Camp Ohlone	(included above)
• Del Valle State Recreation Area	4315 acres
• Mission Peak Regional Preserve	2998 acres
• Vargas Plateau Regional Preserve	1030 acres
• Pleasanton Ridge Regional Park	4742 acres
• Brushy Peak Regional Preserve	1783 acres



2950 Peralta Oaks Court P.O. Box 5381 Oakland, CA 94605-0381
TEL 510 635-0135 FAX 510 569-4319 TDD 510 633-0460 www.ebparks.org

The DEIR should evaluate potential effects to all of these regional parks and provide appropriate mitigation for such effects. These effects could include:

- 14-3-SW 1. Surface water resource impacts from changes in water system operations, changes in primary versus secondary watershed status, changes in existing drainage patterns, increased erosion or deposition of sediments, impacts to riparian vegetation, fisheries and wildlife habitats. The DEIR must identify and fully mitigate such significant effects.
- 14-4-KP-SV 2. Calaveras Dam replacement has the potential for a number of adverse effects to Sunol Regional Wilderness, including impacts to fisheries, plants and wildlife, special-status species, water and air quality, noise, esthetics, recreation, traffic and circulation, and public safety. Potential closure of Calaveras Road, Geary Road or other unpaved access roads or trails to Sunol Regional Wilderness may adversely affect park users and police and fire services. The DEIR must identify and fully mitigate such significant effects.
- 14-5-VLL 3. Water conveyance upgrades, such as replacement or construction of new pipelines, maintenance facilities, treatment facilities, and collection and discharge facilities may adversely affect existing and planned trails and recreation in watershed areas. This would include the Ohlone Wilderness Trail, Bay Ridge Trail, Niles Canyon Trail and other regional and locally operated trails. Such impacts could include closure or rerouting of trails, noise, dust and visual impacts, and trail safety and convenience. The DEIR must identify and fully mitigate such significant effects.
- 14-6-
510-
AW 4. Watershed protection measures currently prohibit water contact recreation and bicycle usage, and restrict dogs and livestock grazing in District-leased portions of Sunol Regional Wilderness. The DEIR must fully consider the effects of new watershed protection measures on these and other District land uses. It is the District's goal to maintain existing uses within these areas and to not have expanded or new use restrictions as a result of this project. We share SFPUC's goal to protect water quality and Alameda Creek Watershed. However, it is also important that SFPUC address the multiple uses for which District parklands have been acquired and to cooperatively work with the District in maintaining these uses within the Watershed.

Please call me if you have any questions regarding our scoping letter. I can be reached at (510) 544-2622. Please include my name on any future mailings regarding this project.

Sincerely,



Brad Olson
Environmental Programs Manager



SIERRA
CLUB
FOUNDED 1892

Letter No. 31

Please reply to:
2530 San Pablo Ave #1
Berkeley CA 94702

October 24, 2005

TO: San Francisco Planning Department
Attn: Paul Maltzer
WSIP Environmental Review
30 Van Ness Ave., Suite 4150
San Francisco CA 94103

FROM: Dan Sullivan, California Water Committee Chair
John Rizzo, San Francisco Bay Chapter Chair
Richard Zimmerman, Loma Prieta Chapter Water Committee Chair

RE: Scope of EIR on Water System Improvement Program
Proposed by San Francisco Public Utilities Commission

These comments are submitted on behalf of the Sierra Club and its chapters in California. The Sierra Club is a California nonprofit corporation with a national membership of approximately 800,000, and a California membership of approximately 200,000. The SFPUC's Water System Improvement Program ("WSIP" or "Program") directly affects the members of three Sierra Club chapters in California: the San Francisco Bay Chapter, the Loma Prieta Chapter, and the Mother Lode Chapter. In addition, Sierra Club members from throughout the country visit and use the Tuolumne River and its watershed for recreational and other purposes.

These comments focus on seven specific issues regarding the scope of the PEIR. The Sierra Club has also joined with other organizations in submitting additional comments about several issues relating to the scope of the PEIR.

1. QUANTITY OF WATER ACTUALLY NEEDED BY SFPUC CUSTOMERS

15-1-
goals

The Program is premised on the conclusion that the SFPUC's customers will need an average annual water supply of 300 million gallons per day (mgd) by 2030. The PEIR should examine the factual basis for this conclusion. The environmental impact of the Program may be significantly reduced or mitigated if the Program's goals can be met by supplying a lower quantity of water.

The PEIR should fully evaluate the potential for water conservation in the SFPUC's service area. If the projected water needs are inflated, the Program will overbuild and spend more public funds than necessary. As a guide to the potential for water conservation in the SFPUC's service area, the PEIR should use the "Best Management Practices" that are identified in the Memorandum of Understanding Regarding Urban Water Conservation in California, which is implemented by the California Urban Water Conservation Council. (We are disappointed to note that 15 of the SFPUC's 28 wholesale water customers have not yet signed onto the Memorandum of Understanding Regarding Urban Water Conservation.)

15-2-
11/1/05
vw/cen

In particular, the PEIR should:

- Look at what the projected water needs will be if all SFPUC customers fully implement the Best Management Practices contained in the Memorandum of Understanding Regarding Urban Water Conservation in California.
- Investigate and evaluate the administrative and regulatory measures that could be adopted in order to lead to greater investments in water conservation by the SFPUC's water agency customers. For example, the SFPUC's water deliveries and/or approval of purchase requests could be tied to implementation of conservation practices by the water agency, or at least be contingent on the water agency joining the California Urban Water Conservation Council and implementing the Best Management Practices.
- Include the costs of environmental mitigation and the economic benefits of water conservation to the environment in all economic calculations of the avoided cost and the cost-effectiveness of water conservation actions.

In addition, the PEIR's projection of water needs for 2030 requires consideration of the impact that the adoption of foreseeable regulatory measures will have on the conservation potential in the service area and on the overall demand projection.

15-3-
11/1/05
vw/cen

In particular, we note that the state Landscape Task Force created in 2004 by AB 2717 has developed a number of recommendations on landscape water use that it will present to the Governor and Legislature in December, as required by AB 2717. We believe that many of these recommendations are likely to be adopted, and therefore the PEIR should consider the impact that their adoption may have on future water needs in the SFPUC service area.

For example, some of the recommendations of the Landscape Task Force that may affect future water needs in the SFPUC service area include the following:

- Urban water suppliers (wholesalers and retailers) should adopt water-conserving rate structures as defined by the Landscape Task Force.
- The Evapotranspiration Adjustment Factor in the state's Model Water Efficient Landscape Ordinance should be reduced, and it should be reviewed every ten years for possible further reduction.
- The use of recycled water should be promoted in urban landscapes.
- The state should require that local landscape ordinances must be at least as effective as the State Model Water Efficient Landscape Ordinance.
- State and local agencies should enforce and monitor compliance with local ordinances and with the state Model Water Efficient Landscape Ordinance, including the creation of

an enforcement mechanism to insure effective irrigation system installation and efficiency.

- The state should require water agencies to install dedicated landscape meters for new, non-single family properties with more than 5000 square feet of irrigated landscapes.

2. QUANTITY OF WATER TO BE DELIVERED BY SFPUC TO ITS CUSTOMERS

The Notice of Preparation states (p. 12) that many SFPUC customers meet a significant portion of their water supply needs from sources other than the SFPUC. This section of the NOP projects that the total water demand within the SFPUC service area will increase by about 11.5% by 2030 (from 374 mgd to 417 mgd). It also projects that the amount of water supplied by the SFPUC will increase by approximately 13.2% by 2030 (from 265 mgd to 300 mgd). It further projects that the SFPUC will provide this increased supply by withdrawing an additional 25 mgd from the Tuolumne River. The Sierra Club believes that the PEIR should not assume that the SFPUC is in fact required to satisfy all of the projected customer purchase requests in 2030. Instead, the PEIR's water supply options should include an alternative in which the SFPUC does not fully meet all of the 2030 customer purchase requests, in order to avoid the environmental harm that will result from the projected increase in diversions from the Tuolumne River.

In this connection, we note that there is a curious discrepancy between the SFPUC's WSIP program description (2/28/05) and the NOP with respect to the quantity of water that is currently delivered by the SFPUC water system. The WSIP program description states that "the regional water system delivers an annual average of approximately 260 million gallons of water per day to a population of 2.4 million water users" (section 2.2, p. 3). The NOP states that "the regional water system currently delivers an average of about 265 million gallons per day (mgd) to about 2.4 million people" (section 2.2, p. 4).

3. ENVIRONMENTAL IMPACT OF INCREASING RATE OF DIVERSION AND CONVEYANCE OF WATER

The WSIP program description states that the current maximum capacity of the system to convey Tuolumne River water from Yosemite National Park to the Bay area is 300 mgd (WSIP sec. 2.2, p. 7). Several components of the Program are intended to increase the conveyance capacity of the system. Neither the NOP nor the WSIP state what the new maximum conveyance capacity will be. Moreover, there is additional uncertainty about the new maximum conveyance capacity as a result of the recent SFPUC staff recommendation to revise the WSIP by eliminating the proposed San Joaquin Pipeline No. 4 and adding other projects. In view of this uncertainty, it is essential that the PEIR must include an analysis of what the new maximum conveyance capacity of the system will be if the Program is implemented, with or without the recently proposed modifications.

A fundamental aspect of the WSIP is to provide the physical capacity for the SFPUC to increase the rate of diversion and conveyance of water from the Tuolumne River above current levels during flood flows, and also during other periods when needed in order to replenish local reservoirs. This increased rate of diversion will result in a decrease in the flow of water down the Tuolumne River below O'Shaughnessy Dam. The PEIR must include an analysis of the

environmental impact of this decrease in the flow of water down the entire length of the Tuolumne River below O'Shaughnessy Dam, through the river's confluence with the San Joaquin River and its outflow in the Sacramento/San Joaquin Delta.

The pipelines and other conveyance facilities that are included in the WSIP will give the SFPUC the physical capacity to divert and convey Tuolumne River water in excess of the average annual quantity of water the SFPUC projects supplying to its customers in 2030. The analysis of environmental impacts in the PEIR should not be limited to the projected quantity of water that the SFPUC anticipates supplying to its customers in 2030. Instead, the PEIR should analyze the environmental impact of operation of the system at the *maximum feasible rate throughout the year*. For example, if the WSIP will give the SFPUC the physical ability to divert and convey a maximum of 400 mgd from the Tuolumne River (approximately 620 cfs; 1 mgd = 1.547 cfs), the PEIR should analyze the environmental impact of a reduction in the flow of the Tuolumne River by 400 mgd (approximately 620 cfs) downstream from O'Shaughnessy Dam throughout the year, and not merely during flood flows and occasional other periods of time. This analysis should consider the impact of the decrease in the flow of water down the entire length of the Tuolumne River through its confluence with the San Joaquin River and its outflow in the Sacramento/San Joaquin Delta.

4. IMPACTS ASSOCIATED WITH CALAVERAS RESERVOIR

The WSIP program description states that one element of the Program is the construction of a replacement Calaveras Dam "*that can be expanded in the future*" (section 4.2, p.30). The Sierra Club is deeply concerned about the environmental impact of the expansion of the Calaveras Reservoir beyond its original capacity of 96,850 acre-feet. In preparing the PEIR, the Planning Department should determine the actual capacity of the new Calaveras Dam that is projected as part of the WSIP. The PEIR should include an analysis of the effect of a dam and reservoir of the size that the SFPUC actually plans to build, even if the SFPUC does not currently plan to expand Calaveras Reservoir beyond its original capacity of 96,850 acre-feet.

Any expansion of the Calaveras Dam beyond its current size will impact surrounding habitat and the Sunol-Ohlone Regional Wilderness. The PEIR should identify what those impacts will be, and it should identify alternatives to avoid those impacts.

The WSIP program description includes the construction of a concrete weir/rubber dam in Alameda Creek to recapture water that is released from Calaveras Reservoir for fish habitat enhancement (section 4.4, p.36). We believe that the PEIR should include an analysis of one or more alternatives that would eliminate this element of the Program, so that the released water is allowed to continue down Alameda Creek to San Francisco Bay.

The WSIP program description states that "the SFPUC will manage its system improvements in a manner that . . . meets at a minimum all regulatory and legal obligations." (Stewardship Policy, p.22.) In light of this policy, the PEIR should include a determination of whether the Program will result in the SFPUC's compliance with California Fish and Game Code section 5937, which requires dam owners to release enough water to keep fish populations downstream from the dam in good condition. We are particularly concerned about the SFPUC's compliance with this legal

45-12-
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obligation with respect to three dams in the Alameda Creek watershed that obstruct or divert natural stream flow -- Calaveras Dam, San Antonio Dam, and Alameda Diversion Dam. We believe that the PEIR should include an analysis of alternatives that would result in compliance with this legal obligation, including (at a minimum) the removal of the Alameda Diversion Dam.

45-13-
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The NOP states that the potential effects to be evaluated include the potential for "changes in a fish population that cause it to drop *below self-sustaining levels*." (Fisheries and Aquatic Resources, p 22.) This phrasing states an inappropriately low standard for the analysis to be provided by the PEIR. The PEIR should evaluate the potential for changes in fish populations that cause them to drop below their *current* levels. In addition, for fish populations that are currently listed as threatened or endangered under state or federal law, the PEIR should evaluate the potential for the Program to contribute to their recovery by *increasing* their populations in the rivers and creeks that are affected by the Program.

5. IMPACTS AFFECTING PILARCITOS CREEK

45-14-
AW

The WSIP includes changes in the operation of Upper and Lower Crystal Springs Reservoirs and San Andreas Reservoir that affect Pilarcitos Creek and contribute to cumulative environmental impacts, but we notice the NOP does not mention the potential impacts of the Program on Pilarcitos Creek. The PEIR must assess the impact of the Program on Pilarcitos Creek.

Pilarcitos Creek, through the Coastside County Water District, provides water to customers located in the City of Half Moon Bay and the unincorporated coastal communities of El Granada, Miramar, and Princeton-By-The-Sea, located in San Mateo County. Through diversion into the SFPUC regional water system, the water of Pilarcitos Creek also serves many parts of the Peninsula.

Many years of coastal development have drained Pilarcitos Creek, reshaped the surrounding land, eroded the channels, and polluted the water. The creek no longer meanders nor empties directly into the ocean. Pilarcitos Reservoir provides only limited direct water to Pilarcitos Creek, because most of the water stored in the reservoir is diverted into Lower Crystal Springs Reservoir to supply SFPUC customers in San Francisco and on the east side of San Mateo County. As a result of the diversion of water out of the Pilarcitos Creek watershed, coastsides groundwater wells in the lower watershed are regularly overdrawn. Threats to steelhead, red-legged frog, and the San Francisco Garter Snake are immediate impacts from the insufficient water in the creek.

The WSIP states that "At the conclusion of the rainy season (approximately April 15th), the following actions are taken to make every effort to fill local reservoirs: . . . Releases from Pilarcitos Reservoir into Pilarcitos Creek . . . cease, other than for water requested by Coastsides County Water District (CCWD)." (WSIP section 2.3.2.1, p. 13) The PEIR should evaluate an alternative that would extend the duration of releases into Pilarcitos Creek beyond the end of the rainy season in mid-April, and that would allow greater amounts of water to be released into Pilarcitos Creek in order to create a more natural flow regime in the creek.

The PEIR also should study an alternative that would provide watershed and fish-passage projects aimed at improving habitat and restoring steelhead in the Pilarcitos Creek watershed, such as through the removal or bypass of Old Stone Dam.

05-15-
SW

The NOP (p. 22) states that "As part of the WSIP, the SFPUC is proposing greater use of groundwater resources in San Mateo and San Francisco Counties as part of the dry-year supply program." In preparing the PEIR, the Planning Department must determine the extent to which the WSIP proposes to increase the use of groundwater from the Pilarcitos Creek watershed. If the WSIP proposes to increase the use of groundwater from the Pilarcitos Creek watershed, then the PEIR must:

05-16-
GW

- Consider the impacts of increased withdrawals of groundwater from the Pilarcitos Creek watershed on fish and wildlife habitat above and below the Pilarcitos Reservoir, and
- Consider the impacts of increased withdrawals of groundwater from the Pilarcitos Creek watershed on the water quality in the creek.

The PEIR also should:

- Consider the environmental impact on Pilarcitos Creek and its surrounding habitats of continuing to store water in the Pilarcitos Reservoir.
- Consider the environmental impact of meeting future demands through more aggressive water conservation and recycling programs, rather than taking water from the Pilarcitos Creek watershed.

05-17- Alt / opt - GW / CH

In order to evaluate the impacts of increasing withdrawals from Pilarcitos Creek or its watershed, the following studies must be conducted:

- Fish and wildlife species and habitat surveys above and below Pilarcitos Reservoir (especially the listed steelhead);
- A flow study to determine whether the current flow regime is meeting the instream flow requirements for fish and wildlife;
- A restoration study plan which provides the necessary information to determine the flows needed for steelhead restoration in Pilarcitos Creek;
- A water supply operations plan which explores ways to offset or mitigate water supply impacts of Pilarcitos Creek restoration;
- Endangered species and habitat surveys on SFPUC lands and streams in the Pilarcitos Creek watershed;
- An assessment of the feasibility and impacts of altering the operation of or removing the Old Stone Dam on Pilarcitos Creek.

05-18-
fid - GW

6. UNFILTERED WATER AS UNDERLYING "PRINCIPLE" FOR WSIP

The NOP states that the SFPUC based the WSIP's goals and system performance objectives on the "fundamental principle" of maintaining an unfiltered water source from the Hetch Hetchy system (section 2.4, p 8). However, the SFPUC's current system already provides filtration for some of the water it supplies to customers, using the Sunol Valley Treatment Plant in the East Bay and the Harry Tracy Treatment Plant near San Andreas Reservoir. The PEIR should examine the extent to which the "principle" of unfiltered water must be followed in order to achieve the goals and objectives of the Program. The PEIR should consider whether the

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P14

environmental impacts of the Program may be mitigated or avoided if the Program is designed to include filtration for all water provided to SFPUC customers.

7. GRAVITY-DRIVEN SYSTEM AS UNDERLYING "PRINCIPLE" FOR WSIP

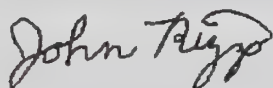
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The NOP states that the SFPUC based the WSIP's goals and system performance objectives on the "fundamental principle" of maintaining a gravity-driven system (section 2.4, p 8). The Sierra Club believes that the PEIR must examine the extent to which this "principle" must actually be followed in order to achieve the goals and objectives of the Program. The PEIR should consider whether the environmental impacts of the Program may be mitigated or avoided if the Program is designed to allow water to be diverted from the Tuolumne River or other sources downstream from O'Shaughnessy Dam.

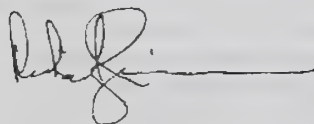
Thank you for your consideration of our comments.



Dan Sullivan
California Water Committee Chair



John Rizzo
San Francisco Bay Chapter Chair



Richard Zimmerman
Loma Prieta Chapter Water Committee Chair

Letter No. 32



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OCT 24 2005

OFFICE OF
ENVIRONMENTAL REVIEW

October 24, 2005

VIA HAND DELIVERY

San Francisco Planning Dept.
Attn: Paul Maltzer, Environmental Review Officer, W.S.I.P. P.E.I.R.
30 Van Ness Avenue, Suite 4150
San Francisco, CA 94103

Re: Comments on the September 6, 2005 Notice of Preparation of the Program Environmental Impact Report for the Water System Improvement Program

Dear Mr. Maltzer:

On behalf of The Tuolumne River Trust ("Trust"), the Stanford Law School Environmental Law Clinic submits these comments regarding the scope of the Program Environmental Impact Report ("PEIR") for the Water System Improvement Program ("WSIP"). Although the Notice of Preparation ("NOP") identifies many of the issues that need to be addressed in the PEIR, the Trust offers suggestions that are necessary to make the environmental review process more complete. The Trust has a long-term commitment to protecting and enhancing the Tuolumne River, as its members boat and fish on its waters and hike along its banks. The Trust is primarily concerned that the San Francisco Public Utilities Commission's ("SFPUC") proposal to increase water diversions from the Tuolumne River would directly, significantly and adversely affect the river.

The taking of Tuolumne water is not without cost to other users of the river. The river provides an outstanding wild trout fishery,¹ one of the most challenging whitewater runs in California,² a diverse

¹ USFWS, ENVIRONMENTAL ASSESSMENT, TUOLUMNE RIVER FLOW SCHEDULE REVISION 19-20 (Feb. 6, 1981) [hereinafter TUOLUMNE RIVER FLOW SCHEDULE REVISION], attached as Exhibit A.

² See National Park Service, Tuolumne River, California, <http://www.nps.gov/rivers/wsr-tuolumne.html> [hereinafter NPS Tuolumne River Website] (noting that the Tuolumne River "contains some of the most noted whitewater in the high Sierras and is an extremely popular rafting stream"), attached as Exhibit B; SUSAN NORMAN, TUOLUMNE RIVER WHITEWATER RECREATION USE ANALYSIS AND MONITORING EVALUATION 1 (Jan. 29, 2001) [hereinafter TUOLUMNE RIVER WHITEWATER ANALYSIS] (noting that the Tuolumne River "offers a classic wilderness river trip characterized by few people, spectacular tributary side hikes, fun and challenging whitewater, and beautiful river beaches, campsites and scenery"), attached as Exhibit C.

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habitat for wildlife,³ a dramatic river canyon,⁴ and the largest wild salmon run in the San Joaquin Valley.⁵ And yet existing biological data indicates that too much water is already taken from the Tuolumne.⁶ The Trust is concerned that the WSIP will degrade the conditions that make the Tuolumne River a unique part of the Sierra Nevada and Central Valley landscapes.

I. Program Description: Objectives & Need

Project Description is not sufficiently broad to include environmental options.

The description of the project does not describe the project need in a way that would allow more environmentally friendly alternatives to be considered. Also, the project need description does not include the need for the SFPUC to improve their stewardship of watershed resources under their care, including the Tuolumne River, Alameda Creek, and the Peninsula watersheds. Although significant watershed needs exist, the SFPUC lacks the appropriate data that would demonstrate current watershed health.⁷

Description of Program Need Pre-Determines Program Goal.

The NOP states that "[t]he SFPUC has also determined that the current regional system cannot . . . meet increases in customer water purchases through the planning year of 2030." This statement pre-determines the goal of meeting customer purchase requests by the year 2030, which is not the only alternative. The SFPUC must also consider not meeting the purchase requests.⁸

³ Species using the river include "peregrine falcon, bald eagle, mule deer, western gray squirrel, yellow warbler, resident trout, and Sierra Nevada red fox." STANISLAUS NATIONAL FOREST, TUOLUMNE WILD AND SCENIC RIVER MANAGEMENT PLAN 8 (rev. May 1988) [hereinafter TUOLUMNE RIVER MANAGEMENT PLAN], *attached as Exhibit D*; *see also* California Rivers Assessment Interactive Web Database listing of Special Status Species, *available at* http://www.ice.ucdavis.edu/newcara/threatened.asp?cara_id=81, *attached as Exhibit E*.

⁴ TUOLUMNE RIVER FLOW SCHEDULE REVISION, *supra* note 1, at 19-20.

⁵ TURLOCK IRRIGATION DISTRICT & MODESTO IRRIGATION DISTRICT, 2005 TEN YEAR SUMMARY REPORT PURSUANT TO PARAGRAPH (G) OF THE 1996 FERC ORDER ISSUED JULY 31, 1996 at 3-75 (Apr. 1, 2005) [hereinafter TEN YEAR SUMMARY REPORT], *attached as Exhibit F*.

⁶ *See* MICHAEL E. ACEITUNO, INSTREAM FLOW REQUIREMENTS FOR RAINBOW AND BROWN TROUT IN THE TUOLUMNE RIVER BETWEEN O'SHAUGHNESSY DAM AND EARLY INTAKE 9, 25 (1992) [hereinafter DRAFT FLOW STUDY] (recommending significant increase in water flow), *attached as Exhibit G*.

⁷ Letter from Tuolumne River Trust to SFPUC (June 10, 2005) (requesting information relating to the status of fisheries and habitat conditions in the Tuolumne River to which a response was not provided due to lack of records), *attached as Exhibit H*; Meeting between Heather Dempsey and Michael Carlin, AGM Water Enterprise (July 1, 2005); Tuolumne River TECHNICAL ADVISORY COMMITTEE, HABITAT RESTORATION PLAN FOR THE LOWER TUOLUMNE RIVER CORRIDOR (Mar. 1999), [hereinafter HABITAT RESTORATION PLAN] *attached as Exhibit I*; Letter from Alameda Creek Alliance et al. to Susan Leal (June 2, 2005) (outlining current needs in Alameda Creek watershed and requesting studies due to a lack of current data), *attached as Exhibit J*.

⁸ *See In re Bay-Delta Programmatic Environmental Impact Report Coordinated Proceedings*, 2005 WL 2469681, at 72-74 (Cal. App. 3d 2005) (holding that "the PEIR/S should have included an alternative that assumed reduced water exports from the Bay-Delta region) In addition, the court reasoned "CALFED appears not to have considered, as an alternative, smaller water exports from the Bay-Delta region which might, in turn, lead to smaller population growth due to the unavailability of water to support such growth. Taking an assumed population as a given and then finding ways to provide water to that population overlooked an alternative that would provide less water for population growth . . . CALFED apparently assumed that the California population

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Insufficient demonstration of need for additional water.

The Trust believes that the program description has not sufficiently demonstrated the need for the WSIP to increase water deliveries.

First, the SFPUC is not required or obligated to provide additional water. The “supply assurance” of the “Settlement Agreement and Master Water Sales Contract” for decades has informed wholesale customers of how much water is available for municipal use.⁹ The City of San Francisco (“City” or “San Francisco”) is only required to provide the water that is available under the City’s existing legal obligations. Agencies are free to pursue additional water supply options, as outlined in Section IV of the Contract, at their own expense.¹⁰

Second, as San Francisco is in charge of the water system, it can require wholesale customers to use water judiciously. San Francisco’s future contracts could require that its wholesale customers implement conservation and plan growth around the resources that are available.

With a greater emphasis on conservation, less “need” exists for the project to increase the burden on the Tuolumne River.¹¹ San Francisco itself has shown that conservation and judicious growth can hold down water demand over the next 25 years. According to the City’s projections, San Francisco water use will change by –10 to +1 mgd.¹² The comprehensive study of the city’s future water needs demonstrate that robust conservation can fully compensate for water demand caused by reasonable growth.¹³ Other cities have predicted little change in water use. For example, Palo Alto, Redwood City, and Daly City provided low-range projections that show a small decrease in water use.¹⁴

The projected increase in water requests is based on insufficient consideration of the water conservation potential. The studies upon which the NOP is based do consider some conservation in the San Francisco retail and wholesale service areas. However, they do not adequately consider all conservation potential. For example, the study only considered the conservation measures deemed “implementable” by each individual agency with no clear description of how that determination was made.¹⁵ The Trust believes

would grow as projected regardless of the availability of water and did not consider whether, if less water was supplied, population growth would be affected accordingly, leading to less demand.” *Id.*

⁹ See REPORT OF THE CITY AND COUNTY OF SAN FRANCISCO TO THE STATE WATER RESOURCES CONTROL BOARD, PHASE ONE, BAY DELTA WATER QUALITY HEARINGS, 88-90 (July 16, 1987) [hereinafter SF WATER REPORT], attached as Exhibit K.

¹⁰ *Id.* at 22-27.

¹¹ The “need” for the program is outlined in NOP § 2.3, and the program goals and objectives are in § 2.4.

¹² SFPUC, SFPUC PURCHASE ESTIMATES AND WATER SUPPLY OPTIONS: CURRENT CONDITIONS AND YEAR 2030 PROJECTIONS 10 (rev. June 28, 2005) [hereinafter SFPUC PURCHASE ESTIMATES AND WATER SUPPLY OPTIONS], attached as Exhibit L.

¹³ CITY AND COUNTY OF SAN FRANCISCO, RETAIL WATER DEMANDS AND CONSERVATION POTENTIAL 3 (Nov. 2004), attached as Exhibit M.

¹⁴ SFPUC PURCHASE ESTIMATES AND WATER SUPPLY OPTIONS, *supra* note 12.

¹⁵ SFPUC WHOLESALE CUSTOMER WATER CONSERVATION POTENTIAL TECHNICAL REPORT, URS CORPORATION & MADDAUS WATER MANAGEMENT at ES-2 (Dec. 2004), attached as Exhibit N. “The range of conservation potential reflects a potential water savings associated with packages of specific conservation measures chosen by the individual wholesale customers that are considered implementable in their individual service areas.” Implementable is then defined as follows: “An implementable conservation measure is a measure

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that additional conservation measures would be considered cost-effective and "implementable" if there were regional implementation and resources. Also, the water-savings associated with local water conservation ordinances or foreseeable state or federal water conservation legislation is not incorporated into this demand figure. The substantial increase in water rates that the WSIP will produce will likely reduce water demand, and this potential effect has also been ignored.

It is instructive to examine closely the entity that is predicting the greatest increase in water purchase requests. The City of Hayward, presently the largest wholesale user, gives a *low-range* estimate of its water demand growing by 59%, or 10.34 mgd by 2030.¹⁶ This accounts for a *third* of the projected water demand growth in the SFPUC service area.¹⁷ No other wholesale user of comparable size predicts such growth. The models used to predict Hayward's water requests for the year 2030 show that Hayward presents several significant adjustments that increased its water use estimates upward, which include:¹⁸

- increased "Unaccounted-for-Water" estimate from 7.2% to 9%;
- creation of a new category for high-use single-family homes estimated to use 438 gallons per day (though Hayward's current homes use 240-270 gpd);
- creation of a new category for high demand commercial and industrial users for a total of 400,000 gpd, based on Hayward's intent to recruit manufacturing facilities to the city; and
- creation of a special category for new renovated single-family homes estimated to use 397 gpd because they are expected to be "remodeled with nicer landscapes and a net increase in water usage."

Considering just the example of Hayward, less environmental impact would occur if Hayward were to consider alternative scenarios:

- improve their water system accounting so as to reduce, rather than increase, their "unaccounted-for-water";
- provide incentives and/or regulations to encourage new or renovated high-use single family homes to install water-saving irrigation fixtures and drought-tolerant landscaping;
- implement a tiered-rate structure to encourage high-end users to conserve; and
- provide incentives and/or regulations to encourage water use efficiency and/or recycling in newly-sited commercial and industrial facilities.

Project description favors protecting local creeks at expense of Tuolumne River.

The wholesale customers' purchase requests are based on the assumption that several agencies will reduce their own reliance on local surface water in favor of SFPUC water. This decision is based on the

that an individual wholesale customer believes can be funded and implemented with success in its service area. An implementable program is a program that consists of a number of measures that can be run concurrently by the individual wholesale customer, can be financed concurrently by an individual wholesale customer, and can be implemented successfully in that wholesale customer's service area." *Id.*; see also *id.* at B-1 (Qualitative Screening Criteria).

¹⁶ *Id.* The percentage was calculated as 10.34 / (27.95 - 10.34).

¹⁷ *Id.*

¹⁸ SFPUC WHOLESALE CUSTOMER WATER DEMAND PROJECTIONS TECHNICAL REPORT, URS CORPORATION & MADDAUS WATER MANAGEMENT, SUMMARY OF CUSTOMER-SPECIFIC MODEL ADJUSTMENTS, App. B at 2-3, (Nov. 2004), available at http://sfwater.org/detail.cfm/MSC_ID/16/MTO_ID/NULL/MC_ID/5/C_ID/2282/holdSession/1, attached as Exhibit O.

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recognition that these sources do not appear to be available in the future because of state and federal regulations.¹⁹ Projections show a decrease in surface water utilization from 4.46 mgd to 3.31 mgd across the service area.²⁰ The NOP includes no such assumption about the need to reduce diversions from the Tuolumne River, even though the evidence suggests that such need already exists.²¹

Project description does not sufficiently describe the objective to “enhance sustainability”²² nor does it provide levels of service for this objective.

The NOP lists sustainability as an overall goal of the WSIP.²³ In addition, expenditures to support sustainability were also included in the 2002 bond act approved by San Francisco voters for this capital program, which stated that the funds could be expended for water system improvements and defined improvements to include “watershed and environmental improvements.”²⁴ However, Table 2 of the NOP lacks specific measures to evaluate whether the WSIP proposed program meets the sustainability objective.²⁵ Furthermore, San Francisco’s own independent review found that the sustainability program was lacking: The October 11, 2005 Parsons/CH2MHill WSIP Assessment report concludes, “activities reflecting the SFPUC’s commitment to integrate the Stewardship Policy and Principles into the WSIP have not been made explicit.”²⁶ The report recommends ensuring that the “watershed stewardship policy is applied consistently to the program and project-specific scopes.”²⁷

The WSIP goals and objectives inappropriately pre-determine the project outcome.

The levels of service described in Table 3 of the NOP assume that the customer purchase requests will be met and that they will be met with Tuolumne River water.²⁸ The level of service objectives are therefore inappropriately based on that assumption. Specifically, the delivery objectives for each turnout assumes that water needs will be met with Tuolumne deliveries rather than other potential sources, such as conservation, recycling, groundwater, or desalination. The same argument can be made for the delivery reliability objective of delivering 300 mgd under shutdown/outage conditions.²⁹

The Trust supports the intent to identify projects and alternatives according to various water supply alternatives.

The Trust supports the NOP’s statement that the “PEIR will identify particular projects that are not needed for one or more of the water supply alternatives and will identify other projects that may be

¹⁹ Phone Conversation, Nicole Sandkula, Senior Water Resources Engineer, Bay Area Water Supply and Conservation Agency, and Jenna Olsen, Tuolumne River Trust, (Sep. 19, 2005).

²⁰ *Id.*

²¹ See *infra* section II.C. for further discussion.

²² NOP § 2.4 at 9.

²³ NOP § 2.5, Table 2, at 10.

²⁴ Proposition A (passed by San Francisco voters Nov. 2002), *attached as Exhibit P.*

²⁵ NOP § 2.5, Table 2, at 10.

²⁶ PREPARED BY PARSONS & CH2MHILL FOR THE SFPUC, WATER SYSTEM IMPROVEMENT PROGRAM ASSESSMENT REPORT at 6-11 (Oct. 11, 2005). [hereinafter PARSONS REPORT], *available at* http://sfwater.org/detail.cfm/ MSC_ID/6/MTO_ID/NULL/MC_ID/7/C_ID/2683/holdSession/1, *attached as Exhibit Q.*

²⁷ *Id.* at ES-5.

²⁸ NOP § 2.5, Table 3, at 11.

²⁹ NOP § 2.5, Table 2, at 10.

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required to implement a water supply alternative, such as a desalination facility and related transmission/treatment systems.”³⁰

II. Environmental Impacts Identified in the NOP

An EIR must identify all of the significant, environmental impacts of a project undergoing environmental review,³¹ including those impacts directly and indirectly caused by the project.³² CEQA defines a significant environmental impact as “a substantial, or potentially substantial, adverse change to the environment.”³³

The Trust has two overarching concerns with the NOP’s treatment of the environmental impacts. Each concern applies to all of the environmental impact categories, and for the sake of brevity is not repeated for each category. Concerns regarding category specific environmental impacts are discussed, in turn, below.

The NOP adopts standards of significance ill-suited to the Tuolumne River’s high environmental value.³⁴

Both CEQA³⁵ and the courts that have interpreted it³⁶ have properly noted that the significance of an impact for a particular project depends on the project’s environmental setting.³⁷ Here, the PEIR should use standards of significance tailored to the Tuolumne River’s high level of environmental³⁸ and recreational value,³⁹ evidenced by its inclusion in the National Wild and Scenic River System.⁴⁰ The

³⁰ NOP § 2.6 at 20.

³¹ CEQA § 21100(b)(1).

³² 14 C.F.R. § 15126.2(a) (hereinafter CEQA Guidelines).

³³ CEQA § 21068.

³⁴ EIRs can utilize pre-established thresholds of significance in determining whether a particular impact is significant. CEQA Guidelines § 15064.7. However, thresholds of significance cannot be applied mechanically to allow a finding of non-significance for an impact that would otherwise be significant based on the particular environmental context of a project. *Cmtys. for a Better Env’t v. Calif. Res. Agency*, 103 Cal. App. 4th 98, 113-14 (2002) (invalidating CEQA Guideline section 15064(h), finding that it improperly allowed lead agencies to ignore evidence that an environmental impact might be significant in a particular project setting); *Gentry v. Murrieta*, 36 Cal. App. 4th 1359, 1416 (1995) (finding fact that project did not cause impacts in excess of those prohibited in town’s general plan insufficient to demonstrate the non-significance of such impacts).

³⁵ CEQA Guidelines §§ 15064(b) (“the significance of an activity may vary with the setting”), 15125(c) (“Knowledge of the regional setting is critical to the assessment of environmental impacts.”).

³⁶ See, e.g., *Meija v. Los Angeles*, 130 Cal. App. 4th 322, 340-42 (2005) (finding that City had improperly relied on a threshold of significance in finding that no significant traffic impact would result from a project because of the particular characteristics of the project area); *Nat’l Parks and Conservation Ass’n v. Riverside*, 71 Cal. App. 4th 1341, 1357 (1999) (approving of EIR that analyzed the significance of an impact differently depending on whether it impacted wilderness or non-wilderness portions of a park).

³⁷ The CEQA Guidelines explicitly note that “an activity which may not be significant in an urban area may be significant in a rural area.” CEQA Guidelines § 15064(b).

³⁸ A recent draft Fish and Wildlife Study noted that “[t]he fishery resources of the Tuolumne River are significant.” DRAFT FLOW STUDY, *supra* note 6, at 10. The Stanislaus National Forest management plan for the portions of the upper Tuolumne outside of Yellowstone National Park identifies several indicator species using the River, including “peregrine falcon, bald eagle, mule deer, western gray squirrel, yellow warbler, resident trout, and Sierra Nevada red fox.” TUOLUMNE RIVER MANAGEMENT PLAN, *supra* note 3 at 8.

³⁹ See *supra* note 2.

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Trust believes that the NOP does not sufficiently take these characteristics of the Tuolumne into account.

While the NOP does not explicitly set forth standards of significance for the potential impacts it identifies, it impliedly adopts such standards by narrowly defining the scope of environmental analysis. Examples, discussed in detail later, include the impacts to fish and wildlife species that the NOP identifies for analysis.⁴¹ The Tuolumne River's inclusion in the National Wild and Scenic River System⁴² makes such low standards of significance all the more inappropriate. The Wild and Scenic River Act prohibits any federal agency from approving any project that will result in a "direct and adverse effect" on the Tuolumne River's recreational, scenic or fish and wildlife values.⁴³ This highly protective federal standard evidences the federal government's judgment of the significance of any "adverse effect." The City should incorporate this judgment⁴⁴ into its determination of standards of significance for the potential environmental impacts of the WSIP.

The NOP does not incorporate standards of significance into its identification of other potentially significant environmental impacts, identifying "changes in surface water quality from program operation or construction activities,"⁴⁵ "effects on special-status species"⁴⁶ and "degradation or obstruction of scenic views and designated scenic resources."⁴⁷ The Trust urges the City to adopt similarly broad standards of significance for these impact categories and to incorporate the Tuolumne River's high environmental value into all portions of the PEIR's environmental analysis.

The PEIR must examine the potential environmental impacts of future Bay Area storage projects (such as the future expansion of Calaveras Reservoir) in concert with the identified capacity and expansion projects in the WSIP (such as the fourth pipeline).

The Trust believes that the NOP should have identified the foreseeable expansion of Bay Area water storage facilities as part of the program that the PEIR will analyze. A PEIR must analyze subsequent activities that are "reasonably foreseeable consequences of the initial project."⁴⁸ The April 2000 Water Supply Master Plan states that "[b]y constructing additional storage capacity, the SFPUC could more

⁴⁰ The upper Tuolumne River, between O'Shaughnessy Dam and Don Pedro Reservoir, is a designated part of the National Wild and Scenic River System, 16 U.S.C. § 1274(53), established to protect rivers that "possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values," 16 U.S.C. § 1271.

⁴¹ NOP § 3.2 at 22 (identifying for analysis "[c]hanges in a fish population that cause it to drop below self-sustaining levels") (discussed in Fisheries and Aquatic Resources Impacts Section II.C., *infra*); NOP § 3.2 at 23 (identifying for analysis "[e]ffects of [sic] species populations and the ability to maintain self-sustaining levels") (discussed in Terrestrial Vegetation and Wildlife Section II.D., *infra*).

⁴² See *supra* note 40.

⁴³ 16 U.S.C.A. § 1278 (b).

⁴⁴ The court in *Communities for a Better Environment v. California Resource Agency* upheld a CEQA Guidelines section because it was "an effective means of . . . integrating CEQA environmental review activities with other environmental program planning and regulation." 103 Cal. App. 4th 98, 111 (2002). Incorporating the federal government's judgment about the importance of protecting the Tuolumne River into the PEIR's analysis of significant impacts will serve a similar integrating function.

⁴⁵ NOP § 3.2 at 22.

⁴⁶ *Id.* at 23.

⁴⁷ *Id.* at 27.

⁴⁸ *Laurel Heights Improvement Ass'n v. Regents of the Univ. of Calif.*, 47 Cal. 3d 376, 396 (1988).

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fully exercise its Tuolumne River water rights. Depending on the location of the additional storage, new or enlarged conveyance facilities would be required to transport water to and from the new reservoirs.⁴⁹

The most likely storage project is the expansion of Calaveras Reservoir. The relocation and re-engineering of the Calaveras Dam (Facility Improvement SV-2)⁵⁰ creates the foreseeable likelihood of a Calaveras Reservoir expansion. Indeed, the WSIP Program Description that the SFPUC provided to the Planning Department to initiate the CEQA review included an explicit statement that the Calaveras Dam project "will provide for planning, design, and construction of a replacement dam that can be expanded in the future."⁵¹ While this language is not included in the current version of the Program Description,⁵² a recent report identified that the Calaveras Dam Replacement Project has not been modified since its inception in 2003.⁵³

In addition, the creation of a fourth pipeline across the San Joaquin Valley (Facility Improvement SJ-3)⁵⁴ makes the future expansion of the Calaveras Reservoir all the more foreseeable. Currently, the three pipelines crossing the San Joaquin Valley limit the ability of the SFPUC to replenish expanded reservoirs in the Bay Area, as the pipelines are the bottleneck of the system.⁵⁵ The creation of both a fourth pipeline and a readily expandable dam will significantly decrease the difficulty of increasing Bay Area storage and the concomitant pressure to increase diversions from the Tuolumne River. Because the Calaveras Reservoir expansion is a foreseeable result of the current WSIP, it should be analyzed with respect to each environmental impact category.

Furthermore, other future storage expansion projects exist. The SFPUC Water Supply Master Plan includes the potential of converting exhausted gravel quarries in the Sunol Valley to water storage reservoirs, expansion of Crystal Springs reservoir, expansion of San Antonio Reservoir, and the construction of new surface reservoirs such as Coral Hollow reservoir along the San Joaquin pipelines.⁵⁶

The WSIP proposes other projects that may expand conveyance and treatment capacity, including: Bay/Division Pipeline Hydraulic Capacity Upgrade (BD-1); Crystal Springs-San Andreas Transmission Upgrade (PN-6); Additional 40 mgd of treated water supply (SV-3); Irvington Tunnel (SV-4); Lower Crystal Springs Dam Improvements (PN-9); Sunol Valley Water Treatment Plant New Treated Water Reservoir (SV-6); Crystal Springs Bypass Tunnel (PN-5).⁵⁷

The PEIR must consider the impacts of all foreseeable capacity expansions.

⁴⁹ SFPUC AND BAY AREA WATER USERS ASSOCIATION, WATER SUPPLY MASTER PLAN, A WATER RESOURCE STRATEGY FOR THE SFPUC SYSTEM, at 38-39 (April 2000) [hereinafter MASTER PLAN], *attached as Exhibit R*.

⁵⁰ NOP § 2.5 at 15.

⁵¹ SFPUC, DRAFT WSIP PREPARED FOR PEIR at 30 (Feb. 28, 2005), *attached as Exhibit S*.

⁵² NOP § 2.6 at 15.

⁵³ REGIONAL WATER SYSTEM IMPROVEMENT PROGRAM 2005: RESPONSE TO AB 1823 LEGISLATION, at WSIP-12 (Draft, Mar. 25, 2005), *available at* http://www.bawsca.org/docs/CIP_UPDATE_1823mar25LESFNL.pdf, *attached as Exhibit T*.

⁵⁴ NOP § 2.6 at 15.

⁵⁵ SF WATER REPORT, *supra* note 9, at 68.

⁵⁶ MASTER PLAN, *supra* note 49, at 38-39.

⁵⁷ NOP at § 2.6 at 15-18.

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A. Surface Water Resources Impacts

Specify Geographic Area.

The NOP identifies categories of potential significant impacts to surface water resources, including: changes in surface water flows, water quality, and existing drainage patterns.⁵⁸ However, the NOP does not identify the particular geographic areas that the PEIR will include in these analyses.⁵⁹ Therefore, the Trust urges the SFPUC to include the following geographic areas in its analysis: 1) the entire Tuolumne main-stem, including the Upper Tuolumne River⁶⁰ below O'Shaughnessy dam and the Lower Tuolumne River below Don Pedro Reservoir, 2) the San Joaquin River, 3) the San Joaquin Delta, and 4) the San Francisco Bay and Delta. Each of these stretches of water is connected to the Tuolumne and will be impacted by the WSIP and each should be included in the PEIR's analysis. Furthermore, the NOP appears to neglect the potential impact of the WSIP on Peninsula streams, such as Pilarcitos Creek.

Specify appropriately high standard of significance.

The PEIR should use a standard of significance for water flow impacts that takes into account the changes these flows will have on river-based recreational opportunities. A recent analysis of Tuolumne River whitewater activity found that in 2000, more than 6,000 boaters used the River.⁶¹ CEQA Guidelines identify the social and economic effects of physical changes in the environment, such as alterations in flow levels, among the things that an agency may consider in determining whether a particular environmental impact is significant.⁶² The Trust urges the City to account for any potential loss of recreational opportunity in determining whether changes to surface water resources will cause significant environmental effects. In particular, the PEIR should view reduced flows on the Upper Tuolumne with particular caution, as the National Park Service has noted that "[t]he importance of preserving spring spills on the Tuolumne River cannot be overestimated."⁶³

Consider the environmental impacts of proposed 25 mgd additional diversions and proposed 25 mgd drought transfer.

The PEIR must also analyze the potential impacts of both the average increased diversion of 25 mgd and the drought response program's 25 mgd water transfer from the Turlock and Modesto Irrigation Districts ("TID/MID").⁶⁴ Such water diversions have the potential to impact two stretches of river: the Upper Tuolumne River between Hetch Hetchy Dam and Don Pedro Reservoir and the Lower Tuolumne River below Don Pedro Reservoir. The PEIR should analyze the potentially significant impacts of additional water diversions and water transfers on both stretches of river.

⁵⁸ NOP § 3.2 at 22.

⁵⁹ The NOP does state that the WSIP "could affect Tuolumne River and/or Alameda Creek." NOP § 3.2 at 22.

⁶⁰ Throughout these comments, the term "Upper Tuolumne River" will refer to any section of the Tuolumne River above Don Pedro Dam. These comments will not differentiate between the section above or below the Hetch Hetchy Reservoir (sometimes referred to as "Upper" and "Middle" Tuolumne River).

⁶¹ TUOLUMNE RIVER WHITEWATER ANALYSIS, *supra* note 2, at 3.

⁶² CEQA Guidelines § 15131(b).

⁶³ Memorandum from Robert O. Binnewies, Superintendent, Yosemite National Park, to Regional Director, Western Region, Department of Interior, 1 (Dec. 13, 1985) [hereinafter 1985 Binnewies Memo] (noting that Tuolumne River flows are important to "recreational and aesthetic values [that] encompass much more than maximizing trout habitat or providing for whitewater boating"), attached as Exhibit U.

⁶⁴ NOP § 2.5 at 13.

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Water transfers from TID/MID to San Francisco will not only result in reduced flows below Don Pedro Dam, but also in reduced flows below O'Shaughnessy Dam. This will occur because the SFPUC does not draw water directly from Don Pedro Reservoir, which provides TID/MID water.⁶⁵ Instead, the water transfers envisioned in the drought response program would allow an O'Shaughnessy Dam diversion of Tuolumne River water previously destined for Don Pedro Dam, thereby transferring the water from TID/MID to the SFPUC.⁶⁶

Consider the impact of all Tuolumne River flow reductions on downstream water bodies.

The PEIR must consider the impact of flow reduction on water quality and fish migration (both downstream and upstream) in not only the Tuolumne River, but also the San Joaquin River, Sacramento-San Joaquin Delta, and San Francisco Bay. The Tuolumne River is the largest tributary of the San Joaquin River and thus its freshwater flows are critical to dilution of pollutants in the San Joaquin River, especially given that all flows in the San Joaquin River at this time (with the exception of extremely high water years) are agricultural return flows.⁶⁷ Thus, San Joaquin River water contains high levels of nutrients and chemicals typically used in production agriculture.⁶⁸ These pollutants are widely credited with causing problems in the delta, including algae blooms, dissolved oxygen problems, and toxicity.⁶⁹

San Francisco is a party to the San Joaquin River Agreement ("SJRA") which implements the State Water Resources Control Board's 1995 Water Quality Control Plan for the lower San Joaquin River and the San Francisco Bay-Delta Estuary.⁷⁰ The SJRA includes the Vernalis Adaptive Management Plan ("VAMP"). VAMP is a "large-scale, long-term (12 year), experimental/management program designed to protect juvenile Chinook salmon migrating from the San Joaquin River through the Sacramento-San

⁶⁵ SFPUC PURCHASE ESTIMATES AND WATER SUPPLY OPTIONS, *supra* note 12, at 15-16.

⁶⁶ *Id.* at 38 n.25 (describing how such transfers would utilize the existing water bank system to transfer rights from TID/MID to the SFPUC and allow for increased diversions at Hetch Hetchy).

⁶⁷ CALFED BAY/DELTA PROGRAM, ECOSYSTEM RESTORATION PROGRAM PLAN: VOLUME 2 – ECOLOGICAL MANAGEMENT ZONE VISIONS, at 384 (June 1999) ("No water passes through the Gravelly Ford [on the San Joaquin River] to Mendota Pool reach except during extremely high runoff periods."), *attached as Exhibit V*; *id.* at 397 ("Flows in the major eastside tributaries to the San Joaquin River (Stanislaus, Tuolumne, and Merced Rivers) are controlled by releases from foothill storage reservoirs . . . Increasing base-flow releases from the tributary reservoirs would increase habitat in the mainstem San Joaquin River for rearing and for upstream and downstream migration of fall-run and late-fall-run Chinook salmon, rainbow trout, and steelhead and for spawning and rearing habitat of American shad, white and green sturgeon, and splittail from the Merced River confluence to Vernalis.").

⁶⁸ CALFED BAY/DELTA PROGRAM, ECOSYSTEM RESTORATION PROGRAM PLAN: STRATEGIC PLAN FOR ECOSYSTEM RESTORATION, D-9 (July 2000), *attached as Exhibit W*. Appendix D describes the San Joaquin as follows: "Water quality is poor for much of the year; there is low dissolved oxygen, high salinity, agricultural, residential, and industrial contaminants, and water temperature is often elevated."

⁶⁹ Mark Grossi & Mark Crosse, *Fresno Bee Special Report: Rescuing the San Joaquin*, FRESNO BEE (1999), available at <http://www.fresnobee.com/man/projects/savesjr/mainbar.html>, *attached as Exhibit X*.

⁷⁰ PREPARED BY SAN JOAQUIN RIVER GROUP AUTHORITY FOR THE CALIFORNIA WATER RESOURCE CONTROL BOARD IN COMPLIANCE WITH D-1641, THE SAN JOAQUIN RIVER AGREEMENT, available at <http://www.sjrg.org/agreement.htm>, *attached as Exhibit Y*.

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Joaquin Delta.”⁷¹ Pursuant to VAMP, the SJRA members make water available to meet instream flow targets. The adequacy of instream flow in the delta is currently the subject of legal disputes.⁷² The PEIR must consider how reduced flows in the Tuolumne River will impact the ability of the SJRA parties to meet VAMP flow targets and how that could impact juvenile Chinook salmon and other fish migration.

B. Groundwater Impacts

The PEIR must consider impacts to groundwater resources in the Tuolumne watershed.

The PEIR will not identify the potential for the WSIP to impact groundwater resources in the Tuolumne River watershed. Because surface water and groundwater are connected, and water often flows between the two, depleting the amount of water flowing down the Tuolumne River will impact groundwater resources throughout the Tuolumne watershed.

In particular, the proposal to transfer 25 mgd from the TID/MID has great potential to impact groundwater resources in Stanislaus County. By transferring District water to the SFPUC service area, the WSIP could reduce the amount of acreage in Stanislaus County under flood irrigation, which could reduce groundwater recharge rates. This will place an additional burden on the Tuolumne River as it flows through the Central Valley, because groundwater likely contributes to river flow in that reach.⁷³

In addition, the transfer of water from the Districts to the SFPUC may force District customers to increase their reliance on local wells, which could reduce the amount of water in the Central Valley aquifers. The lower level of groundwater could in turn increase the concentration of pollutants and contaminants in the groundwater, thus forcing existing users of groundwater (including agricultural and urban users such as the City of Modesto) to use more surface water. This will increase the pressure on the Tuolumne River.

⁷¹ ANNUAL TECHNICAL REPORT ON IMPLEMENTATION AND MONITORING OF THE SAN JOAQUIN RIVER AGREEMENT AND THE VERNALIS ADAPTIVE MANAGEMENT PLAN, Executive Summary, at 3 (2004), *available at* <http://www.sjrg.org/technicalreport/default.htm>, *attached as* Exhibit Z.

⁷² The State Water Board is considering cease and desist orders against the United States Bureau of Reclamation and the Department of Water Resources for Delta operations and salinity violations, *see* http://www.waterrights.ca.gov/Hearings/usbr_dwr_cdo_hearing.html.

⁷³ Michael G. Mooney, *City Leaders Want Water Protected: Agreement with MID: Modesto to get its water before any sold to SF*, MODESTO BEE, (Oct. 5, 2005) (“Vance Kennedy, a retired hydrologist for the U.S. Geological Service and a Modesto-area farmer, said Wednesday that diverting as much as 29,000 acre-feet of Tuolumne River water annually, as proposed by the San Francisco PUC, could have serious consequences for Modesto and Stanislaus County. More and more, Kennedy said, the region's groundwater is being depleted. He cited more drip irrigation as one of the reasons. Kennedy advocates flood irrigation, contending that some of the water – contained by berms surrounding an orchard, for example – eventually percolates into the soil, recharging groundwater. As a result, Kennedy said, the assumption that water diverted from the Tuolumne River would be covered by groundwater is faulty at best. Modesto already is dealing with contaminated wells. As groundwater is depleted, the concentration of toxic substances, some of which occur naturally, increases. Eventually, those toxic substances force the city to close the wells and engage in expensive treatment processes to restore them.”), *attached as* Exhibit AA.

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C. Fisheries and Aquatic Resources Impacts

As previously mentioned, the Trust believes that the NOP utilizes an under-inclusive standard that will not identify all significant impacts on Tuolumne River fisheries. While the Tuolumne River has nationally recognized environmental value, the NOP incorporates the lowest standard of significance for fishery impacts that CEQA would allow for any project, requiring the analysis of "changes in a fish population that cause it to drop below self-sustaining levels."⁷⁴ CEQA Guidelines section 15065 uses this same standard to trigger a mandatory finding of significance and thus the creation of an EIR.⁷⁵ Essentially, section 15065 creates minimum standards that apply to projects irrespective of their environmental context or the value of the surrounding natural habitat.

The minimum requirements of CEQA Guidelines section 15065 do not suggest that lesser impacts are not significant.⁷⁶ CEQA requires a lead agency to assess the significance of impacts based on a project's environmental context. Determining whether an impact is significant "calls for careful judgment on the part of the public agency involved, based to the extent possible on scientific and factual data. An ironclad definition of significant effect is not always possible because the significance of an activity may vary with the setting. For example, an activity which may not be significant in an urban area may be significant in a rural area."⁷⁷ The adoption of such a lenient standard of significance is wholly inappropriate given the exceptional environmental qualities of the Tuolumne River. Instead, the SFPUC should develop standards of significance based on the "scientific and factual data" available about the Tuolumne River.⁷⁸

Tuolumne River flow standards are likely to become more protective in future.

Tuolumne River flows are subject to review and regulation by the state and federal government.⁷⁹ The SFPUC and Department of the Interior have an established spill and flow schedule to protect the Tuolumne River's environmental values.⁸⁰ The Department of the Interior, however, intends for year-

⁷⁴ NOP § 3.2 at 22.

⁷⁵ CEQA Guidelines § 15065(a)(1) (requiring a finding of significance and an EIR where the project may "substantially degrade the quality of the environment; substantially reduce the habitat of a fish or wildlife species; cause a fish or wildlife population to drop below self-sustaining levels; threaten to eliminate a plant or animal community; substantially reduce the number or restrict the range of an endangered, rare or threatened species; or eliminate important examples of the major periods of California history or prehistory").

⁷⁶ See *Mejia v. Los Angeles*, 130 Cal. App. 4th 322 (2005) ("[A]n impact need not satisfy the requirements of a mandatory finding of significance to be considered a significant impact.")

⁷⁷ CEQA Guidelines § 15064(b).

⁷⁸ *Id.*

⁷⁹ See *infra* Section III.A (discussing settlement agreements involving SFPUC, Department of Interior, and environmental groups, and providing history of regulation of Tuolumne River flows); see also Order Amending License and Dismissing Rehearing Requests Issued July 31, 1996 for Project Nos. 2299-024 and -031 [hereinafter FERC License], attached as Exhibit BB.

⁸⁰ SFPUC Resolution No. 84-0565, Exhibit A (Dec. 3, 1984) [hereinafter SFPUC Flow Schedules], attached as Exhibit CC. In 1987, the SFPUC and Department of Interior further modified their 1985 agreement. Modification for Kirkwood Powerhouse Unit No.3 to Stipulation for Amendment of Rights-of-Way for Canyon Power Project Approved by Secretary of the Interior on May 26, 1961 to Fulfill the Conditions Set Forth in Provision 6 of Said Amended Permit 2, 7-8 (March 11, 1987) [hereinafter 1987 DOI-SFPUC Settlement], attached as Exhibit DD.

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to-year river conditions to exceed the minimum flows established by the agreement.⁸¹ In addition, the SFPUC has a legal obligation under the 1987 DOI-SFPUC agreement,⁸² as well as a settlement agreement with environmental groups, including the Trust,⁸³ to study the impact of the existing flow regime, and increase flows if the study finds that the existing regime cannot maintain healthy fish populations.⁸⁴ The preliminary study produced by the Fish and Wildlife Service examining these issues found existing flow and spill levels insufficient for healthy fish populations and recommended substantial increases.⁸⁵ These agreements, and the most recent study of the condition of Tuolumne River fish populations, should inform the assessment of what would constitute a significant impact on Tuolumne River fish and aquatic resources.

As previously discussed, the Tuolumne River is included in the National Wild and Scenic Rivers System.⁸⁶ The high level of protection that the federal government granted to the Tuolumne River should be incorporated into the standard of significance the PEIR uses to analyze fish impacts. In addition, the value of fishing recreational opportunities on the Tuolumne River requires a finding that small impacts to fish populations can be significant.⁸⁷

The Tuolumne River below Don Pedro is subject to regulation by the Federal Energy Regulatory Commission⁸⁸ and a Settlement Agreement among utilities, resource agencies, and environmental groups.⁸⁹ The flow schedule is currently under a ten-year review and scheduled for license renewal in 2016. There is also the potential for increased flow requirements based on the anticipated listing of Central Valley steelhead.⁹⁰

Based on these factors, the Trust urges the City to analyze *all* likely impacts on Tuolumne River fish, rather than limiting its analysis to impacts that exceed a particular threshold. In so doing, the City will have to conduct a comprehensive survey of fish populations on the Tuolumne River, thoroughly catalogue the habitats below O'Shaughnessy Dam, and produce a finalized study of the current flow regime. Based on the Fish and Wildlife Service draft study, finding that flow levels are already

⁸¹ See Letter from G. Ray Arnett, Ass't Sec'y, Fish and Wildlife and Parks, to Rudolf Nothenberg, Gen. Mgr., SFPUC 3-4 (Aug. 1984) [hereinafter 1984 Arnett-Nothenberg Letter] ("It has always been understood that actual flows would in most years exceed those minimums" established in the SFPUC flow schedules), *attached as* Exhibit EE.

⁸² 1987 DOI-SFPUC Settlement, *supra* note 80, at 7-8.

⁸³ Interim Agreement – Between City and County of San Francisco, California Trout, Friends of the River, Sierra Club, and Tuolumne River Preservation Trust Regarding Fisheries Studies to Determine the Effect of the Kirkwood Powerhouse on the Fisheries Resources of the Tuolumne River from O'Shaughnessy Dam to Early Intake (Nov. 4, 1985) [hereinafter Interim Agreement], *attached as* Exhibit FF.

⁸⁴ See 1987 DOI-SFPUC Settlement, *supra* note 80; Interim Agreement, *supra* note 83.

⁸⁵ DRAFT FLOW STUDY, *supra* note 6 at 26 (providing recommended flow schedule in excess of that provided for in the SFPUC flow schedules).

⁸⁶ See *supra* note 40.

⁸⁷ CEQA Guidelines § 15131(b) (allowing an agency to consider economic or social effects of a project in the determination of whether an impact is significant).

⁸⁸ FERC License, *supra* note 79.

⁸⁹ New Don Pedro Proceeding P-2299-024 Settlement Agreement, 1995, *attached as* Exhibit GG.

⁹⁰ NMFS Request for Stay of Proceedings on Petition to Re-Open License, Don Pedro Hydroelectric Project, Federal Energy Regulatory Commission, no. 2299-053, July 25, 2005, *attached as* Exhibit HH.

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inadequate for fish species,⁹¹ the Trust suggests that any greater than de minimis impact on Tuolumne River fish populations constitutes a significant environmental impact.

Consider all impacts to habitat and all wildlife.

The PEIR must consider impacts of the WSIP, especially from the proposed increased Tuolumne River diversions, on the entire river ecosystem, not just solely on fish populations. "The foundation of a river ecosystem is the dynamic interaction of flowing water, sediment, and riparian vegetation."⁹² Alteration of one of these factors disrupts the balance of the other factors. For example, the absence of floods allows fine sediments to accumulate in gravels, inhibiting the survival of fish eggs.⁹³ Reducing flood flows can also lead to reduced riparian tree recruitment (i.e. cottonwood trees), which can cause water quality impacts such as increased erosion and temperature.⁹⁴

Special emphasis should be placed on impacts on aquatic insect populations because they are a key part of the food chain for the river ecosystem.⁹⁵ Although the NOP identified impacts to the extent of habitat or habitat quality, it must also consider impacts to habitat accessibility and habitat variability (e.g. pools and rapids, seasonal variability, etc). At the very least, adequate baseline data must be produced on the following elements: geomorphic processes, channel morphology, instream habitat conditions, water quality (temperature, dissolved oxygen levels, turbidity), diversity and abundance of macroinvertebrates, birds, fish, amphibians, and riparian vegetation. The impact of new diversions on these elements must be evaluated. The timing and amount of potential new diversions must be examined in relation to the river's ecological processes in order to be meaningful. The PEIR's evaluation should define the timing, flow, magnitude, duration, frequency, and rate of additional diversions of the various program alternatives. The PEIR must compare the effects of each alternative on defined ecological benchmarks (such as water temperature, habitat formation or requirements of aquatic species) with specific protocols. The studies should clearly examine multiple locations along the Tuolumne (minimum of seven) and should encompass a sufficient span of water years (minimum of 35 years).

D. Terrestrial Vegetation and Wildlife

The Trust believes that the NOP may not identify all significant impacts to terrestrial species.⁹⁶ The NOP states that the PEIR will analyze the "[e]ffects of[n] species populations and the ability to maintain self-sustaining levels."⁹⁷ It is unclear whether the NOP intends to limit the analysis in the PEIR to those impacts that would prevent a species from being self-sustaining, as it does in the fishery context. However, the Trust believes that the PEIR should analyze all impacts to wildlife and utilize standards of significance based on the Tuolumne River's exceptional environmental values.⁹⁸

⁹¹ DRAFT FLOW STUDY, *supra* note 6, at 26 (recommending flow regime "for the maintenance of rainbow and brown trout").

⁹² HABITAT RESTORATION PLAN, *see supra* note 7, at 7.

⁹³ *Id.*

⁹⁴ *Id.*

⁹⁵ *Id.* at 8.

⁹⁶ NOP § 2.3 at 23.

⁹⁷ *Id.* The text of the NOP reads "Effects of species populations and the ability to maintain self-sustaining levels." We assume that the SFPUC intended to require the effect of the project, and therefore the word "of" is mistaken.

⁹⁸ *See* discussion at notes 35 to 41 and associated text.

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The NOP also identifies that the PEIR will analyze the “[e]ffects on special-status species.”⁹⁹ The NOP does not identify the particular special-status species that the PEIR will consider.¹⁰⁰ The potential impact of the WSIP on the San Joaquin River Refuge is of particular importance because of the range of special-status species that live in its riparian habitats. “Ten of the fourteen birds identified by the California Partners in Flight as ‘Riparian Focal Species’ have been found on the San Joaquin River refuge as breeders (Black-headed Grosbeak, Blue Grosbeak, Common Yellowthroat, Song Sparrow, Swainson’s Hawk, Yellow Warbler) or migrants (Swainson’s Thrush, Warbling Vireo, Willow Flycatcher, Wilson’s Warbler).”¹⁰¹ In addition, the Least Bell’s Vireo, a sub-species extirpated from the Central Valley of California for 60 years, has recently reappeared at the San Joaquin River Refuge.¹⁰²

E. Recreation Impacts

The Trust does not believe that the NOP properly takes account of the significant recreational impacts that the WSIP may cause.¹⁰³

Fishing.¹⁰⁴

First, as discussed above, the PEIR will not sufficiently analyze the impact of the WSIP on fish populations, and hence on recreational fishing opportunities, an important source of recreation and employment.¹⁰⁵

Insufficient analysis of whitewater boating.

Similarly, the NOP does not call for sufficient analysis of whitewater boating (rafting, kayaking, boogie boarding, etc) opportunities,¹⁰⁶ also an important source of employment.¹⁰⁷ The Tuolumne River “contains some of the most noted whitewater in the high Sierras and is an extremely popular rafting

⁹⁹ NOP § 2.3 at 23.

¹⁰⁰ Potential impacts on the numerous special-status species found in the Tuolumne River watershed must also be considered. See California Rivers Assessment Interactive Web Database listing of Special Status Species, *supra* note 3. A list of 737 riparian plant species found in the Tuolumne River watershed can also be found at http://www.ice.ucdavis.edu/newcara/riparian3.asp?cara_id=81.

¹⁰¹ PRBO Conservation Science, San Joaquin River National Wildlife Refuge: San Joaquin River NWR Songbird Monitoring, available at <http://www.prbo.org/cms/index.php?mid=108>, attached as Exhibit II.

¹⁰² News Release, Sacramento Fish and Wildlife Office, Songbird Missing from California’s Central Valley for 60 Years Reappears at San Joaquin River National Wildlife Refuge (June 15, 2005), attached as Exhibit JJ.

¹⁰³ NOP § 3.2 at 24.

¹⁰⁴ The Trust assumes that the first bullet point under the Recreation section (NOP § 3.2 at 24) inadvertently omitted “water- based recreation facilities [and activities]” so as to include an analysis of impacts on fishing and boating.

¹⁰⁵ See William C. Stewart, *Economic Assessment of the Ecosystem*, SIERRA NEVADA ECOSYSTEM PROJECT: FINAL REPORT TO CONGRESS VOL. III, at 44 (1996) [hereinafter *Economic Assessment of the Sierra Nevada*], available at http://ceres.ca.gov/snep/pubs/web/PDF/VIII_C23.PDF, attached as Exhibit KK. The Economic analysis found that recreational fishing in the Sierra Nevada produced \$146 million in annual economic value. *Id.* The analysis also found that recreation and tourism accounted for 23,000 jobs in the region. *Id.* at 65.

¹⁰⁶ NOP § 3.2 at 24 (listing the effects on boating and rafting as among those to be considered, but not including such an analysis in the bulleted list of potential effects to be analyzed).

¹⁰⁷ See *Economic Assessment of the Sierra Nevada*, *supra* note 105, at 44 (finding that the economic value of whitewater rafting in the Sierra Nevada region is over 50 million dollars a year).

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stream.”¹⁰⁸ As indicated above, more than 6,000 boaters use the River each year.¹⁰⁹ The analysis does not examine the relationship between actual daily flow volume and boat trips,¹¹⁰ but suggests that changes in average flow rates change the timing of peak use.¹¹¹ Changes in the Tuolumne River flow regime caused by the WSIP may thus shift whitewater recreation demands and cause boaters to turn to other regional rivers.¹¹² On Cherry Creek, a tributary of the Tuolumne River, “high use is occurring fairly frequently.”¹¹³ Shifting recreational whitewater demand from the Upper Tuolumne River to other rivers in California, such as the Stanislaus (a similar class IV run), will cause further crowding and increased environmental impact.

PEIR must also analyze impacts of water withdrawals on other recreation, such as hiking, sightseeing, and birding.

Water levels in the upper Tuolumne River also contribute to the recreational experience of tourists off of the river. “[T]he sight of the surging whitewater and the thunderous roar of the river in spring runoff is an exhilarating experience for many.”¹¹⁴ The aesthetic experience of the surging Tuolumne is enjoyed each year by thousands of visitors.¹¹⁵

The PEIR should address the impact that the WSIP may have on recreational opportunities including fishing, whitewater boating, and hiking, and examine the potential environmental impacts associated with shifting users to other Sierra Nevada rivers and scenic areas.

F. Socioeconomic Impacts

CEQA requires the analysis of the socioeconomic impacts that a project may cause when such impacts in turn may cause a physical change in the environment.¹¹⁶ The NOP properly recognizes that the

¹⁰⁸ NPS Tuolumne River Website, *supra* note 2. The Tuolumne River “offers a classic wilderness river trip characterized by few people, spectacular tributary side hikes, fun and challenging whitewater, and beautiful river beaches, campsites and scenery.” TUOLUMNE RIVER WHITEWATER ANALYSIS, *supra* note 2, at 1.

¹⁰⁹ TUOLUMNE RIVER WHITEWATER ANALYSIS, *supra* note 2, at 3. Figure 1A indicates total private and public use in excess of 6,000. *Id.* In addition, the Analysis notes that compliance with permitting for private boaters has never been analyzed, and thus the analysis probably undercounts private boater. *Id.* at 2 (noting that on similar run in Georgia, an analysis found an 80% compliance with a private boater permitting system).

¹¹⁰ *Id.* at 5.

¹¹¹ *Id.* at 6.

¹¹² The addition of the third generator at Kirkwood, although only expected to operate at peak flows, was projected to reduce spill by more than 20% during those periods. 1985 Binnewies Memo, *supra* note 63, at 3.

¹¹³ TUOLUMNE RIVER WHITEWATER ANALYSIS, *supra* note 2, at 8.

¹¹⁴ 1985 Binnewies Memo, *see supra* note 63, at 3.

¹¹⁵ *Id.* at 1 (“Each year thousands of visitors view the Tuolumne River gorge and Poopenaut Valley from Hetch-Hetchy road, and many of these visitors hike into Poopenaut Valley to experience the river at closer range.”).

¹¹⁶ CEQA § 21082.2 (“[E]vidence of social or economic impacts which do not contribute to, or are not caused by, physical impacts on the environment is not substantial evidence [of significant environmental impacts].”); CEQA Guidelines § 15131(a) (“An EIR may trace a chain of cause and effect from a proposed decision on a project through anticipated economic or social changes resulting from the project to physical changes caused in turn by the economic or social changes.”). The court in *Citizens Association for Sensible Development of Bishop Area v. County of Inyo* found an EIR insufficient because it did not analyze whether a newly permitted shopping center would “take business away from the downtown shopping area and thereby cause business closures and eventual physical deterioration of downtown Bishop.” 172 Cal. App. 3d 151, 169 (1985).

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magnitude of the WSIP has the potential to create the type of socioeconomic impacts referenced in CEQA.¹¹⁷ However, the NOP limits such analysis to the “potential socioeconomic effects of drought rationing, general conservation, and water supply costs and . . . the potential socioeconomic effects of the WSIP on the customers within the regional system service area that could, in turn, result in physical environmental effects.”¹¹⁸ The NOP thus ignores the impact of the WSIP on those that rely on the Tuolumne River for their livelihoods. As previously noted, tourism and recreation play an important role in the communities surrounding the upper Tuolumne River. Indeed, “[t]he private recreational and tourism sector is the single largest employer in the Sierra Nevada.”¹¹⁹ Rather than limiting the scope of the PEIR's socioeconomic analysis to possible impacts on SFPUC customers, the City should analyze such impacts with respect to all of the communities associated with the Tuolumne River.

G. Growth Inducing Impacts

CEQA requires that the City analyze any significant growth inducing impact of the WSIP.¹²⁰ This analysis should include projects that “remove obstacles to population growth” and should not “assume[] that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.”¹²¹ Courts have routinely found that infrastructure projects implemented to accommodate population growth, such as the WSIP, cause growth inducing impacts that must be analyzed.¹²²

The WSIP falls squarely into the category of projects aimed at catalyzing future development because one of its explicit purposes is to provide water to accommodate growth.¹²³ The NOP says that the PEIR will evaluate the following: 1) the “[r]elationship of the 2030 customer purchase requests for water supply to the planned growth and land uses reflected in currently adopted local land use plans”, 2) the “[r]egional growth projections for the service area from the Association of Bay Area Governments and the California Department of Finance” and 3) the secondary effects of projected growth.¹²⁴ From the current description, it is unclear how this evaluation will identify the extent of the WSIP growth inducing impacts. The Trust urges the city to use a baseline for its growth inducing impact analysis based on the likelihood and extent of growth without any increase in SFPUC water deliveries. From this baseline, the PEIR can determine the extent to which the WSIP induces growth. The fact that growth is “planned” and included in “General Plans”¹²⁵ is not relevant to this inquiry.

¹¹⁷ NOP § 3.2 at 27.

¹¹⁸ *Id.*

¹¹⁹ *Economic Assessment of the Sierra Nevada*, *supra* note 105, at 65.

¹²⁰ CEQA Guidelines § 15126.2(d).

¹²¹ *Id.*

¹²² See, e.g., *Stanislaus Audubon Soc'y, Inc. v. Stanislaus*, 33 Cal. App. 4th 144, 158-59 (1995) (EIR for country club project needed to analyze its growth inducing impacts even though “the exact extent and location of such growth cannot now be determined”); *Antioch v. City Council*, 187 Cal. App. 3d 1325, 1337-38 (1986) (finding that EIR had inappropriately ignored the growth inducing impacts of a road and sewer project). The CEQA Guidelines also identify infrastructure projects as likely to require the analysis of growth inducing impacts. CEQA Guidelines §§ 15064(d)(2) (“For example, the construction of a new sewage treatment plant may facilitate population growth in the service area due to the increase in sewage treatment capacity and may lead to an increase in air pollution”); 15126.2(d) (citing the expansion of a waste water treatment plant as an example of a project likely to have growth inducing impacts).

¹²³ NOP § 2.5 at 12.

¹²⁴ NOP § 3.2 at 27.

¹²⁵ *Id.*

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The NOP itself suggests that the WSIP would play a significant role in facilitating future growth in the SFPUC service area. The water demand section of the NOP projects that of the predicted 43 mgd increase in water demand, the SFPUC would provide all but 8 mgd.¹²⁶ While this does not necessarily mean that growth would not be accommodated by alternate sources of water without the WSIP, it does suggest that the WSIP would seriously facilitate regional growth.

H. Cumulative Impacts

CEQA requires an EIR to analyze the "incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects."¹²⁷ Lead agencies must carefully assess these cumulative impacts to avoid understating the overall impact a project may have on the environment.¹²⁸ A project contributing only slightly to an already unacceptable environmental condition has significant cumulative impacts; even a slight deterioration of an existing problem can be significant.¹²⁹

The NOP properly identifies that the PEIR will analyze the cumulative impacts of the WSIP in conjunction with "past, present, and reasonably foreseeable projects sponsored by the SFPUC and others."¹³⁰ However, the NOP does not identify any specific cumulative impacts that it will consider. The Trust urges the City to pay particular attention to the WSIP's potential cumulative impacts because of the pervasiveness of existing river operations and management, and find that even slightly increased pressure on the Tuolumne River constitutes a significant cumulative impact. In particular, the Trust believes that even marginal deteriorations of Tuolumne River flow conditions or the health of fish stocks should be considered significant cumulative impacts. Both the draft Fish and Wildlife Service flow study and the Ten Year Review of FERC flows support the Trust's position; if existing flow conditions

¹²⁶ NOP §2.5 at 12. The 43 MGD increase in water demand was calculated by subtracting existing demand (374 mgd) from projected demand (417 mgd). The 8 mgd increase not provided by the SFPUC was calculated in two steps. First, existing non-SFPUC water resources was calculated by subtracting current SFPUC water supply (265 mgd) from existing demand in the SFPUC service area (374 mgd), equaling 109 mgd. This was then subtracted from projected non-SFPUC water resources (identified in NOP as 117 mgd), for a total of 8 mgd increase in non-SFPUC water resources. *Id.*

¹²⁷ CEQA Guidelines § 15355(b).

¹²⁸ See *Citizens To Preserve the Ojai v. Ventura*, 176 Cal. App. 3d 421, 431 (1985) ("A cumulative impact analysis which understates information concerning the severity and significance of cumulative impacts impedes meaningful public discussion and skews the decision-maker's perspective concerning the environmental consequences of the project, the necessity for mitigation measures, and the appropriateness of project approval."); *San Franciscans For Reasonable Growth v. San Francisco* 151 Cal. App. 3d 61, 80 (1984) ("[I]t is vitally important that an EIR avoid minimizing the cumulative impacts. Rather, it must reflect a conscientious effort to provide public agencies and the general public with adequate and relevant detailed information about them.").

¹²⁹ See *Los Angeles Unified School Dist. v. Los Angeles*, 58 Cal.App.4th 1019, 1025 (1997) ("[T]he relevant issue to be addressed in the EIR [is] . . . whether any additional amount of traffic noise should be considered significant in light of the serious nature of the traffic noise problem already existing around the schools."); *Kings County Farm Bureau v. Hanford*, 221 Cal. App. 3d 692, 718 (1990) ("The relevant question to be addressed in the EIR is . . . whether any additional amount of precursor emissions should be considered significant in light of the serious nature of the ozone problems in this air basin.).

¹³⁰ NOP § 3.2 at 27.

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are insufficient to maintain healthy fish populations on both the Upper and Lower Tuolumne, any decrease in flow will result in significant cumulative impacts.¹³¹

Other planned water withdrawal projects along the Tuolumne River make the PEIR's cumulative impact analysis particularly important. Currently, MID and Turlock are designing water treatment plants to increase Tuolumne River water deliveries to local cities.¹³² The PEIR must consider the potential impacts of such projects in analyzing the cumulative impacts of the WSIP.

III. Legal Infeasibility of WSIP

The City has legal obligations to preserve water flow in the Tuolumne River that would prevent the City from taking as much water as municipal resellers want to buy.¹³³ They include two legal settlements, one with the Department of Interior and one with various environmental groups, which directly restrict the City's use of Tuolumne River water. In addition, other future legal obligations may force the City to increase instream flow releases.¹³⁴ These legal obstacles may prevent the City from pursuing the WSIP in its current form.¹³⁵

A. Settlements with the Department of Interior and Environmental Groups

The legal contest with the Department of the Interior dates back to at least 1958, when the City sought permission to move plans to construct a right-of-way for a tunnel to bring water to hydroelectric generators "due to substantial savings in construction costs."¹³⁶ The Department of the Interior authorized the modification, on the condition that the City release water according to a set schedule. The original, tentative water release schedule was to be superseded after a two-year joint study on water conditions.¹³⁷

The 1976 water condition study, the Tuolumne River Flow Study Report, found that the on-going minimum releases to the Tuolumne River were "inadequate for the protection of the downstream fishery, recreational, and esthetic values."¹³⁸ The Study recommended an increase in flow of 129%.¹³⁹

¹³¹ DRAFT FLOW STUDY, *supra* note 6, at 26 (recommending flow regime "for the maintenance of rainbow and brown trout"); see also TEN YEAR SUMMARY REPORT, *supra* note 5.

¹³² John Holland, *Turlock OKs \$4.6M for Plant Design*, MODESTO BEE, (Oct. 12, 2005), attached as exhibit LL; Michael G. Mooney & Garth Stapley, *MID, Council Strike Deal on Water*, MODESTO BEE, (Oct. 12, 2005), attached as Exhibit MM.

¹³³ NOP § 2.4 at 9 (listing one of the WSIP objectives as meeting the future water demands of customers).

¹³⁴ See SFPUC PURCHASE ESTIMATES AND WATER SUPPLY OPTIONS, *supra* note 12, at 4, 26; see also TEN YEAR SUMMARY REPORT, *supra* note 5.

¹³⁵ See *infra* Section IV. The first alternative would rely entirely on Tuolumne River surface water for projected water demand. NOP § 3.3 at 30.

¹³⁶ *In re City and County of San Francisco*, Notice of Appeal, Reasons and Argument, 6 (Aug. 6, 1959), attached as Exhibit NN. The City sought to move the plans to construct the right-of-way from the south bank of the Tuolumne River to the north bank.

¹³⁷ Stipulations for Relocation and Amendment of Rights-of-Way for Tunnel Aqueduct, United States Land Office, Amended Sacramento Serial No. 010130 (May 3, 1961), attached as Exhibit OO.

¹³⁸ Letter from Douglas P. Wheeler, Ass't Sec'y, Fish & Wildlife & Parks, to O. L. Moore, Gen. Mgr, Hetch-Hetchy Water & Power (Dec. 13, 1976), attached as Exhibit PP.

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The City objected to the study's methodology, and formally protested the report before an administrative law judge.¹⁴⁰ Several environmental groups, including the Trust, intervened.¹⁴¹

In 1984, the City resolved its dispute with the Department of the Interior, agreeing to flow increases of 63% in normal water years, 38% dry years, and a flow decrease of 3% in critically dry years, with the flow schedule to be determined each year based on measured precipitation.¹⁴² Moreover the City agreed that,

[A]ny expansion, alteration, or other modification of the water and power supply facilities which could alter flows along [the Tuolumne River from O'Shaughnessy Dam to Early Intake] will be subject to review by the Department of the Interior for the purpose of determining what change, if any, should be made in the flow release schedule.¹⁴³

Throughout the process, the Department of the Interior maintained that the flow schedule was understood to establish minimum flows, not actual flows.¹⁴⁴ Paragraph six, excerpted above, was added to clarify that the City *does not have the right to alter actual flow* without approval from the Department.

Finally, a word about paragraph #6 in Appendix I seems appropriate. It is worth reiterating that the basic premise of the entire flow study process since 1961 has been to establish *minimum* flows. It has always been understood that *actual* flows would in most years exceed those minimums. The establishment of these flow requirements has not been with the intention of thereby approving additional projects that would have the adverse effect of making the minimum flows, in fact, the actual flow. It is for this reason that paragraph #6 has been added to the stipulation. This paragraph would require additional study and Departmental approval, consistent with the limited authorities presently available to the Department, before project changes can be initiated that will impact on *actual* flows.¹⁴⁵

That is to say, the approval of the Department of Interior is needed even if the City project's physical construction would lie entirely outside Yosemite's borders, because the Tuolumne River flow within the parkland would diminish.

¹³⁹ Letter from O. L. Moore, Gen. Mgr., Hetch Hetchy Water & Power, to Thomas Kleppe, Sec'y of the Interior (Oct. 6, 1976), *attached as* Exhibit QQ. The percentage was calculated in acre feet annually as (83,144 – 36,305) / 36,305.

¹⁴⁰ *Id.*

¹⁴¹ *In re* Protest to the Tuolumne River Flow Study Report, Petition to Intervene Granted (July 7, 1977), *attached as* Exhibit RR.

¹⁴² SFPUC Flow Schedules, *supra* note 80. The percentages were calculated in acre feet annually as (59,235 – 36,305) / 36,305; (50,019 – 36,305) / 36,305; (35,215 – 36,305) / 36,305. SF WATER REPORT, *supra* note 9, at 83 (defining terms “normal,” “dry,” and “critically dry”).

¹⁴³ Stipulation for Amendment of Rights-of-Way for Canyon Power Project ¶ 6, SFPUC Resolution No. 84–0565, *supra* note 80 [hereinafter 1984 Stipulation].

¹⁴⁴ The City agreed that “the stipulation does not have the intention or effect of ‘approving additional projects that would have the adverse effect of making the minimum flows, the actual flows.’” Letter from Rudolf Nothenberg, Gen. Mgr., SFPUC, to G. Ray Arnett, Ass’t Sec’y for Fish & Wildlife & Parks (Nov. 21, 1984), *attached as* Exhibit SS.

¹⁴⁵ 1984 Arnett-Nothenberg Letter, *supra* note 81.

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In the early 1980s the City proposed installing a third generator at the Kirkwood Powerhouse, which lies outside the borders of Yosemite but uses water diverted at Hetch Hetchy reservoir.¹⁴⁶ The additional water diverted through the Canyon Tunnel for the generator decreases water available for river flows in the Upper Tuolumne.¹⁴⁷ The same environmental groups, including the Trust, who intervened in the Department of the Interior administrative proceeding regarding the 1976 Tuolumne River Flow Study report, also opposed the plan to install the third Kirkwood unit.¹⁴⁸ In November 1985, the City entered into an Interim Agreement with the groups in return for dropping opposition to the generator.¹⁴⁹ The purpose of the Interim Agreement was to provide the City and the Department of the Interior time to enact an "agreement concerning additional fisheries studies to be conducted by the Commission as well as implementation of increased flows should they be mandated by the fisheries studies" and to allow the environmental groups to "function as interested parties who shall have standing to enforce the terms and conditions of said agreement [with the City/DOI]."¹⁵⁰

As a result of the Interim Agreement, in March 1987, the City and DOI finalized a settlement agreement to allow for installation of the third Kirkwood unit.¹⁵¹ The City/DOI agreement called for a second study on the fish populations between O'Shaughnessy Dam and the powerhouse to be completed by December 1992.¹⁵² The City agreed to increase flows if called for by the study, subject to maximum releases.¹⁵³ A draft of the study, *Instream Flow Requirements for Rainbow and Brown Trout in the Tuolumne River Between O'Shaughnessy Dam and Early Intake*, was finished in 1992.¹⁵⁴ It recommended a significant increase in river water flows to maintain healthy fish populations: 16,130 acre-feet more in normal years, 12,817 acre-feet more in dry years, and 23,990 acre-feet more in critically dry years.¹⁵⁵

Despite the City's legal commitments to the environmental groups and the Department of the Interior, the study was never finalized and the City has not modified its river operations.¹⁵⁶ No explanation has

¹⁴⁶ Letter from William P. Horn, Ass't Sec'y for Fish & Wildlife & Parks, to Dean Coffey, General Mgr., San Francisco Water Dept. (Nov. 15, 1985) [hereinafter 1985 Horn-Coffey Letter], *attached as Exhibit TT*; see also Letter from Ginny Puddefoot, OER Project Coordinator, to John Amodio, Tuolumne River Preservation Trust (Mar. 9, 1984), *attached as Exhibit UU*.

¹⁴⁷ 1985 Horn-Coffey Letter, *supra* note 146.

¹⁴⁸ See Letter from Gregory Thomas, Legal Coordinator, Tuolumne River Preservation Trust, to Dean Macris, Director of Planning, Dept. of City Planning (Apr. 14, 1984) *attached as Exhibit VV*.

¹⁴⁹ Interim Agreement, *supra* note 83.

¹⁵⁰ Interim Agreement, *supra* note 83, at 1, 7.

¹⁵¹ 1987 DOI-SFPUC Settlement, *supra* note 80, at 3-5. This agreement was essentially a modification of the 1985 City/DOI agreement, *supra* note 80.

¹⁵² *Id.*

¹⁵³ *Id.*

¹⁵⁴ DRAFT FLOW STUDY, *supra* note 6.

¹⁵⁵ *Id.* at 26, Exh. A, 5227 + 4721 + 5227 + 5951 + 6149 + 7438 + 9223 + 9223 + 3719 + 2975 + 5227 + 5058 + 5227 - 59235 = 16130; 4304 + 3888 + 4304 + 4165 + 4304 + 7438 + 8301 + 8301 + 2975 + 2083 + 4304 + 4165 + 4304 - 50019 = 12817; 3074 + 3332 + 3689 + 4463 + 6149 + 7438 + 7686 + 7686 + 2975 + 2380 + 3689 + 3570 + 3074 - 35215 = 23990 (calculated in acre feet annually as total recommended release minus agreed upon release).

¹⁵⁶ "Average Daily Required Fishery Release Schedule Below O'Shaughnessy Dam" provided by the SFPUC to Heather Dempsey at stakeholder meeting October 13, 2005, *attached as Exhibit WW*.

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been provided for the long-delayed finalization of the study. The "rough draft" appears complete in all respects. Only one six-month extension of time was granted, and that request indicated that no additional money was necessary.¹⁵⁷

The City is obligated under the settlement with the Trust¹⁵⁸ and others to increase the flow by the maximum amount it promised. These flow increases would limit the water the City could use for the Bay Area water system under the WSIP.

B. Federal Requirements

The WSIP invokes federal statutes, including the Raker Act, the Wild and Scenic Rivers Act and the National Environmental Policy Act, which pose obstacles to the City's ability to divert more water from the Tuolumne River.

1. Raker Act

The Raker Act clearly limits the amount of water that San Francisco can divert from the Tuolumne River. In addition to requiring San Francisco to release water to meet the senior water rights of Turlock Irrigation District and Modesto Irrigation District, the Act further limits Tuolumne diversions because San Francisco may not divert more water than is "necessary" from the Tuolumne.¹⁵⁹

Raker Act Section 9(h) provides:

"That the said grantee shall not divert beyond the limits of the San Joaquin Valley any more of the waters from the Tuolumne watershed than, together with the waters which it now has or may hereafter acquire, shall be necessary for its beneficial use for domestic and other municipal purposes."¹⁶⁰

Since San Francisco must fulfill its "beneficial use" water needs with "waters which it now has or may hereafter acquire," Tuolumne River water must be a source of last resort for San Francisco.¹⁶¹ San Francisco has interpreted this section of the Raker Act as follows: "section 9(h) of the Raker Act requires San Francisco to make full use of its local sources of water."¹⁶²

The Notice of Preparation interpreted this requirement in the Raker Act in an overly narrow way:

"under the WSIP, the regional water system would continue to comply with the conditions of all applicable institutional and planning requirements, including: . . . maximizing use of water from local watersheds."¹⁶³

¹⁵⁷ SFPUC Resolution No. 93-0062 (Mar. 9, 1993) attached as Exhibit XX.

¹⁵⁸ The Trust will be following up with the City regarding the City's obligations under the settlement agreements.

¹⁵⁹ 38 Stat. 242, § 9(h) (1913).

¹⁶⁰ *Id.*

¹⁶¹ *Id.*

¹⁶² SF WATER REPORT, *supra* note 9, at 9.

¹⁶³ NOP § 2.5 at 9.

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The Raker Act does not define the “water which it now has” as “water from local watersheds.” It is true that San Francisco “now has” water rights to water from Bay Area creeks including Alameda, Arroyo Hondo, Calaveras, San Antonio, San Mateo, Pilarcitos, and San Andreas.¹⁶⁴

However, it is also true that San Francisco “now has” waters that it is discharging from waste water treatment plants¹⁶⁵ that could be recycled, waters in underground aquifers,¹⁶⁶ waters recoverable through water use efficiency and water conservation measures,¹⁶⁷ and waters in San Francisco Bay and the Pacific Ocean that could be used for desalination.¹⁶⁸ The Raker Act requires San Francisco to use the “waters which it now has” (normally described by the SFPUC as its “local sources of water”) to the full extent possible. Then, and only then, may San Francisco divert water from the Tuolumne River. “Local sources of water” should include local creeks, groundwater, conservation, recycling, and desalination. San Francisco must maximize water from these sources before it proposes to increase the amount of water it diverts from the Tuolumne River.

2. Wild and Scenic Rivers Act and National Environmental Policy Act

As discussed above, the 1985 settlement agreement between the Department of Interior and the City provides that “San Francisco agrees that any proposed expansion, alteration, or other modification of the water and power supply facilities which could alter flows along [the Tuolumne River from O’Shaughnessy Dam to Early Intake] will be subject to review by the Department of the Interior.”¹⁶⁹ Given that the City’s WSIP proposes diverting more water from the Tuolumne, thereby decreasing flows in the river, the City needs to obtain review and approval from the Department of Interior before moving forward with the WSIP.

The Tuolumne River, “from its sources on Mount Dana and Mount Lyell in Yosemite National Park to Don Pedro Reservoir,” is protected under the Wild and Scenic Rivers Act.¹⁷⁰ The Act provides that “[n]o department or agency of the United States shall recommend authorization of any water resources project that would have a direct and adverse effect on the values for which [a protected] river was

¹⁶⁴ NOP at 4.

¹⁶⁵ PREPARED BY RMC WATER AND ENVIRONMENT FOR THE SFPUC, SAN FRANCISCO’S RECYCLED WATER PROGRAM: RECYCLED WATER MASTER PLAN FOR THE CITY AND COUNTY OF SAN FRANCISCO, PUBLIC DRAFT (Sept. 2005), *attached as Exhibit YY*. The Plan identifies demand for recycled water at 13,200 acre-feet per year. *Id.* at ES-6. PREPARED BY RMC WATER AND ENVIRONMENT FOR THE SFPUC, WHOLESALE CUSTOMER RECYCLED WATER POTENTIAL TECHNICAL MEMORANDUM (Dec. 2004), *attached as Exhibit ZZ*. The Memorandum identifies a range of 30,337 to 37,398 acre-feet per year. *Id.* at 11.

¹⁶⁶ SFPUC, NORTH WESTSIDE GROUNDWATER BASIN MANAGEMENT PLAN FINAL DRAFT (Apr. 2005), *attached as Exhibit AAA*.

¹⁶⁷ SFPUC Presentation on Retail Water Conservation Program presented to Bay Area Water Stewards (BAWS) (July 20, 2005) (identifying study results and future conservation program opportunities), *attached as Exhibit BBB*.

¹⁶⁸ SFPUC, East Bay Municipal Utilities District, Contra Costa Water District, and Santa Clara Valley Water District, Bay Area Regional Desalination Project Fact Sheet (Feb. 2004) (identifying potential for 120 million gallons per day), *available at* <http://www.valleywater.org/media/pdf/BayAreaRegionalDesalProjectFactSheet02-046.pdf>, *attached as Exhibit CCC*.

¹⁶⁹ SFPUC Resolution No. 84-0565, Att. 1, ¶ 6 (Dec. 3, 1984), *supra* note 80.

¹⁷⁰ 16 U.S.C. § 1274(a)(53). The sections of river immediately adjacent to the O’Shaughnessy and Early Intake Dams are excepted.

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established.”¹⁷¹ The Department of Interior will need to analyze the WSIP to determine whether it will cause a “direct and adverse” impact before it authorizes the project.

The National Environmental Policy Act (“NEPA”)¹⁷² requires the preparation of an Environmental Impact Statement (“EIS”) for “major Federal actions significantly affecting the quality of the human environment.”¹⁷³ A major federal action that must undergo environmental review under NEPA, includes specific projects that require federal agency approval.¹⁷⁴ Where a project requires both an EIS and an EIR, CEQA states that the lead state agency “should try to prepare a combined EIR-EIS,” and “must involve the federal agency in the preparation of the joint document.”¹⁷⁵ NEPA requires that the federal agency participate in the EIR-EIS process; the agency cannot adopt an already completed state document as its own.¹⁷⁶ Since the WSIP requires Department of Interior approval pursuant to the 1985 settlement agreement, the City should engage the Department in the process as soon as possible to avoid any delay resulting from duplicative environmental review.

IV. Alternatives

The Trust urges the SFPUC to expand the number of alternatives considered in the PEIR. Currently, the NOP contains only three alternatives to the proposed project. The first relies on the Tuolumne River to meet all demand increases, the second relies on non-Tuolumne River surface water and desalination, plus all sources from the third option, to meet all demand increases conservation, and the third relies on water conservation, recycled water, and groundwater to meet all demand increases. Given the legal obstacles discussed above for the first alternative, and that the second and third alternatives listed in the NOP would take no water from the Tuolumne River, these alternatives are legally insufficient because CEQA requires analysis of a full range of alternatives.

The Trust proposes that the SFPUC consider several intermediate options, which rely on a combination of Tuolumne and other sources of water to meet projected water demands. Additionally, given that all alternatives are not required to meet all program objectives, the SFPUC should consider a WSIP alternative that only meets seismic and water quality objectives. Finally, the PEIR should consider an alternative that provides objectives and projects to meet the sustainability objective.

A. Inadequacy of SFPUC Alternatives

An EIR must give reasonable consideration to alternatives in light of the nature of the project.¹⁷⁷ While the lead agency has the discretion to adopt a reasonable number of variations,¹⁷⁸ addressing a range of

¹⁷¹ 16 U.S.C. § 1278(a). Section 1278(a) also states that no federal agency “shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river was established.” *Id.*

¹⁷² 42 U.S.C. §§ 4231-4370d.

¹⁷³ 42 U.S.C. § 4332(2)(C).

¹⁷⁴ 40 C.F.R. § 1508.18(b)(4).

¹⁷⁵ CEQA § 15222.

¹⁷⁶ 42 U.S.C. § 4332(2)(D); CEQA § 15222 (“[Federal] involvement is necessary because federal law generally prohibits a federal agency from using an EIR prepared by a state agency unless the federal agency was involved in the preparation of the document.”).

¹⁷⁷ See *Rancho Palos Verdes v. City Council*, 59 Cal. App. 3d 869, 892 (1976).

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impacts, the Trust does not believe that the all or nothing approach adopted in the Notice of Preparation is sufficient.

Inyo v. Los Angeles sets the standard for the sufficiency of EIR alternatives for a municipal water system. The SFPUC's first proffered alternative of relying solely on Tuolumne River water for increased municipal water needs, with limited conservation measures, is squarely rejected as inadequate by *Inyo*. "Alternative 1 . . . is not a meaningful alternative to the 'project' for it simply proposes greater environmental invasion for the same purposes."¹⁷⁹

If conservation and recycled water sources are not fully analyzed in the second alternative, environmental damage could be shifted to the Delta and other surface water sources.

The third alternative proposed by the SFPUC would rely entirely on conservation, recycled water, and groundwater to meet increased municipal water needs. Although this alternative would clearly be most desirable from both an economic and ecologic standpoint, there may be insufficient information at this time to determine its feasibility.

B. Intermediate Alternatives

Given the difficulty of determining the feasibility of conserving the full amount of anticipated additional water requests, and the relative ease of determining the feasibility of conserving more than the 10 mgd in the proposed program, the Trust believes the current range of alternatives omits potentially effective alternatives. As *Inyo* noted, "The omitted alternative is a tangible, foreseeably effective plan for achieving distinctly articulated water conservation goals within the Los Angeles service area. It is doubtful whether an EIR can fulfill CEQA's demands without proposing so obvious an alternative."¹⁸⁰

Therefore, the PEIR should consider several intermediate alternatives that do not rely on a single water source, and have different combinations of water sources, relying to the greatest extent possible on system-wide conservation, recycling, and groundwater. These water sources might include the Tuolumne River, other surface water including Delta water, groundwater, and desalination. Water sources, like desalination, may not be excluded solely due to cost. "The fact that an alternative may be more expensive or less profitable is not sufficient to show that the alternative is financially infeasible."¹⁸¹

The Trust is mindful that the City's wholesale users assert that California or federal law requires the City to provide water beyond the supply assurance.¹⁸² However, the City is certainly not obligated to supply only Tuolumne water. Due to the legal impediments against taking more Tuolumne water, the City would certainly need to diversify the water sources it uses. Although Hayward and other cities with

¹⁷⁸ See *Village Laguna v. Board of Supervisors*, 134 Cal. App.3d 1022, 1028 (1982). In *Village Laguna*, the court held that on a proposal to build 20000 units, it was enough to consider 0, 7500, 10000, and 25000 units as the range of alternatives. Project opponents could not demand the consideration of another alternative of 15000 units. The WSIP alternatives, analogizing to *Village Laguna*, amount to considering only 0 units and 25000 units.

¹⁷⁹ *Inyo v. Los Angeles*, 71 Cal. App. 3d 185, 201 (1977).

¹⁸⁰ *Id.* at 203.

¹⁸¹ *Citizens of Goleta Valley v. Board of Supervisors*, 197 Cal. App. 3d 1167, 1181 (1988).

¹⁸² SF WATER REPORT, *supra* note 9, at 89 n.166.

Trust's comments 10/24/2005

great appetites for water may protest if the cost of expensive alternative water sources is levied on them, such issues are not relevant to environmental law.

C. Modified No-Action Alternative

The Planning Department should consider an alternative that does not purport to meet projected water demands, and instead limits the WSIP objectives to seismic retrofit and water quality. This alternative would meet the objectives that were the main impetus for the WSIP and for the bond funding to implement it. A PEIR "must focus on alternatives capable of eliminating any significant adverse environmental effects or reducing them to a level of insignificance, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly."¹⁸³

This modified alternative has other benefits. First, it is unclear, as discussed in Section I, whether the projected water demands are accurate or reflect full conservation measures across the service area. Second, as discussed above, the SFPUC has only just begun the studies and investigations necessary to determine the full potential and feasibility of conservation, recycling, groundwater, and desalination.¹⁸⁴ Finally, it is questionable if meaningful commitments can be made by the wholesale customers and/or the SFPUC regarding future water deliveries outside the context of a contract (the current contract is due to expire in 2009 and will be re-negotiated). Developing a long-range water supply and reliability plan in concert with contract negotiations provides the opportunity for more rational and informed decision-making.

D. Additional Alternatives

The Planning Department should also examine an alternative that does not build San Joaquin Pipeline #4 while still meeting objectives within the delivery reliability goal. The Parsons/CH2MHill WSIP Assessment report identifies a much less damaging alternative to building the fourth pipeline that involves building only a nine-mile section of new pipeline, installing two new cross connections, and repairing the existing three pipelines.¹⁸⁵ The Commission is expected to make a recommendation on this alternative in the next several weeks.

The Planning Department should consider an alternative that defines performance measures and projects to enhance sustainability. For example, the alternative could define acreage of restored riparian habitat, target increases in populations of sensitive species, or recreational enhancements.

¹⁸³ *Kings County Farm Bureau v. Hanford*, 221 Cal. App. 3d 692, 733 (1990).

¹⁸⁴ PARSONS REPORT, *supra* note 26. "An overall study of drought-related strategy does not appear to have been conducted for the SFPUC. The identified projects are the product of an effort to address a portion of the issue." The report further states that the WSIP includes "only two projects addressing drought scenarios. The cost and water supply benefit of these projects should be considered in the context of an overall strategy that addresses the potential and cost-effectiveness of projects by the wholesale customers and to a desalinization plant." The report concludes that "There is no overall system-wide strategy to guide implementation of projects such as reclamation and groundwater." *Id.* at 6-10, 6-11.

¹⁸⁵ *Id.* at 4-7.

Trust's comments 10/24/2005

The Planning Department should also consider an alternative that assumes that the maximum releases identified in the 1987 Agreement are the required minimum flows for the Tuolumne River. This approach would use the precautionary principle.¹⁸⁶

IV. Need for Mitigation Measures

The Trust supports the stated intent to identify programmatic mitigation measures in the PEIR.¹⁸⁷ This large public works project has great potential to harm the environment, and thus it is appropriate to consider and implement mitigation at the program level.

V. Conclusion

Thank you for allowing the Trust the opportunity to submit these comments regarding the scope of the PEIR. As indicated in the above comments, the Trust has numerous concerns regarding the scope of the PEIR and we appreciate your consideration of these comments.

Sincerely,



Holly Gordon
Stephen Lindholm
Justin Pidot

¹⁸⁶ Chapter 1, Precautionary Principle Policy Statement (San Francisco), *attached as Exhibit DDD*.

¹⁸⁷ NOP § at 1.

Letter No. 33



Alan C. Lloyd, Ph.D.
Agency Secretary

State Water Resources Control Board

Division of Water Rights

1001 I Street, 14th Floor • Sacramento, California 95814 • (916) 341-5300
Mailing Address: P.O. Box 2000 • Sacramento, California • 95812-2000
FAX (916) 341-5400 • Web Site Address: <http://www.swrcb.ca.gov>
Division of Water Rights: <http://www.waterrights.ca.gov>



Arnold
Schwarzenegger
Governor

OCT 03 2005

Diane Sokolove
San Francisco Planning Department
30 Van Ness Avenue, Suite 4150
San Francisco, CA 94103

In Reply Refer
to: 334:KDM:266.0
City & County of S.F.
Dept. of City Planning

OCT 05 2005

Dear Ms. Sokolove:

OFFICE OF
ENVIRONMENTAL REVIEW

NOTICE OF PREPARATION (NOP) FOR THE WATER SYSTEM IMPROVEMENT PROGRAM
DRAFT ENVIRONMENTAL IMPACT REPORT (DEIR), SAN FRANCISCO PUBLIC UTILITIES
COMMISSION (SFPUC), SCH#2005092026, TUOLUMNE RIVER

Division of Water Rights (Division) staff has reviewed the NOP for the project identified above. The project is designed to increase water supply to serve San Francisco, San Mateo, Santa Clara, Alameda and Tuolumne Counties. The water supply options described in the NOP would meet the projected 35 million gallon per day (mgd) (which equals 54 cubic feet per second) needs for the year 2030 by increased diversion from the Tuolumne River coupled with increased conservation, water recycling and groundwater supply programs. The NOP states that in non-drought years, the SFPUC would divert an additional 25 mgd from the Tuolumne River under its existing water rights. In drought years, the SFPUC would acquire up to 25 mgd of supplemental dry-year Tuolumne River water through water transfer agreements with Modesto Irrigation District and/or Turlock Irrigation District, among other measures. Another option for evaluation includes Delta water transfers. The NOP also indicates that there may be impacts to Alameda Creek.

The SFPUC diverts water from the Tuolumne River via a pre-1914 appropriative water right. Appropriative water rights become fixed in time based on the maximum quantity collected to storage in any one year, the maximum quantity removed from storage in any one year for beneficial use, the quantity directly diverted, and the quantity put to full beneficial use. The diversion season also becomes fixed. For the City and County of San Francisco, the water rights were quantified in *Meridian Limited v. City and County of San Francisco et al.* (case citation omitted). It appears that the pre-1914 appropriative right was solely for storage of water. The project listed in the NOP is a direct diversion project. Any new diversions must be accomplished pursuant to an appropriative right obtained from the State Water Resources Control Board (State Water Board).

In reviewing the Meridian case, Division staff notes that most of the water appropriated from the Tuolumne River for the Hetch Hetchy project was used for hydroelectric power generation. Hydropower generation is considered a non-consumptive use right because the water is returned to the stream system. In general, a non-consumptive water right cannot be used as the basis for new, consumptive uses of water.

An appropriative water right issued by the State Water Board is also required for any increased diversion from Alameda Creek.

Thus, it appears that the DEIR should include sufficient information for the State Water Board to use the document for water right permitting purposes. Therefore, the document should evaluate the availability of unappropriated water after taking into consideration prior rights and the water required to maintain public trust resources. Division staff recommends that any evaluation utilize a cumulative flow impairment methodology, such as the assessment method described in the *Guidelines for Maintaining*

Diane Sokolove

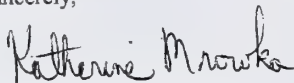
2

Instream Flows to Protect Fisheries Resources Downstream of Water Diversions in Mid-California Coastal Streams (Draft) prepared by NOAA Fisheries Service and the Department of Fish and Game and dated June 17, 2002.

The DEIR should also evaluate the potential effects of increased dry-year water transfers on public trust resources. Moreover, the document should identify the quantities of water available for transfers under different climatic conditions.

If there are any questions regarding this letter, please telephone me at (916) 341-5363.

Sincerely,

A handwritten signature in cursive script that reads "Katherine Mrowka".

Katherine Mrowka, Chief
Watershed Unit 3

E. TRANSCRIPTIONS OF FREMONT AND SAN FRANCISCO SCOPING MEETINGS

SFPUC Calaveras Dam Replacement Project
Case No. 2005.0161E

Public Scoping Report
Davis & Associates/ETJV

PUBLIC SCOPING MEETING -- SFPUC

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PUBLIC SCOPING MEETING

Proposed Calaveras Dam Replacement Project

Environmental Impact Report

DATE: November 14, 2005
TIME: 6:35 p.m.
LOCATION: FREMONT MAIN LIBRARY
2400 Stevenson Boulevard
Fremont, California
REPORTED BY: Melissa Roen Williams, CSR, RPR
Certified Shorthand Reporter
License Number 12284

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PUBLIC SCOPING MEETING -- SFPUC

1 PUBLIC SCOPING MEETING

2 MS. SOKOLOVE: Hi, folks. Sorry that we're
3 starting a couple minutes late. So good evening, and
4 welcome to tonight's public scoping meeting for the
5 Calaveras Dam Replacement Project.

6 My name is Diana Sokolove, and I'm a senior
7 environmental planner with the San Francisco Planning
8 Department Major Environmental Analysis Division, and
9 I'll be the moderator for tonight's meeting.

10 With me here tonight are a couple folks
11 representing the San Francisco Public Utilities
12 Commission. Dave Rogers here is the project manager,
13 and he will be giving a presentation on the project
14 later this evening. And Craig Freeman is the
15 environmental project manager. And Betsy Lauppe Rhodes
16 is the communications manager for the PUC.

17 So I just want to explain the purpose of
18 tonight's meeting for those of you who may be unfamiliar
19 with the environmental review process. Most of this
20 evening will be devoted to hearing from you and to
21 obtain your comments on the scope and the focus of the
22 environmental impact report and also the issues that we
23 should address in the impact report. This really is
24 your opportunity to share with the planning department
25 your thoughts on what we should look at in the

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1 environmental impact report and help us identify any
2 potentially significant environmental effects and also
3 identify reasonable project alternatives. We're really
4 here tonight to hear from you and to listen to you.
5 We'll try to get through this presentation part as
6 quickly as possible.

7 And this is not really a question-and-answer
8 session. If you do have questions about the project or
9 the environmental review process beyond what we're going
10 to talk about tonight, we can stay here after the
11 meeting until the library closes and answer your
12 questions. And we're of course available any time after
13 this meeting.

14 So here's our meeting agenda. We'll give a
15 presentation, a brief presentation of the environmental
16 review process, just a big picture overview for a few
17 minutes. And then Dave will give a presentation, an
18 overview of the proposed project. We'll hear your
19 comments, and then we'll wrap up the meeting.

20 Just also so you know, we do have a court
21 reporter here tonight, and so she will be recording all
22 of your comments.

23 And just before we get to our presentation, I
24 just want to call out a few housekeeping items.
25 Hopefully when you walked in, you signed our sign-in

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1 sheet. That's our way of keeping track of you
2 throughout this process. So if you want to hear from
3 us, again, be sure to sign that sign-in sheet very
4 legibly, so we can keep in touch with you throughout the
5 process.

6 Also, if you do plan on speaking tonight,
7 please fill out a speaker card. It looks something like
8 this. And those are available at the front tables. And
9 Becky will be collecting those in the back there. So
10 please be hand those in to her as soon as you have one
11 filled out.

12 And another item you may wish to pick up is a
13 comment form. You are welcome to give your oral
14 comments tonight. We'd like to hear from you. But if
15 you don't choose to speak tonight, you can certainly
16 fill out the comment form and put your written comments
17 in the -- there's a white box on this table here so that
18 you can drop those off, and we'll get those from you.

19 And also, written comments can also be
20 submitted after this meeting through the 30th of
21 November. E-mail comments, letters, faxes, those are
22 all forms in which we can accept comments.

23 And just a couple of additional housekeeping
24 items. The restrooms are located out this door and to
25 the right. And if you would, kindly turn off your cell

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1 phones and pagers so that we're not interrupted during
2 the meeting. And if you need to take a phone call,
3 please do so outside of the room.

4 So now I'll just take a few minutes to give an
5 introduction and some background on the environmental
6 review process. Again, please hold your comments until
7 after we get through the presentation and when we get to
8 the public comment period. We'd like to hear from you.

9 So the environmental review process is also
10 known as the California Environmental Quality Act or
11 CEQA process. It's intended to produce informational
12 documents about a project's potential environmental
13 impacts. So therefore the main reason again why we're
14 here tonight is to solicit both written and verbal
15 suggestions on the scope and the focus of the
16 environmental review on this project.

17 And also, just for projects sponsored by the
18 City of San Francisco -- in this case the project is
19 sponsored by the San Francisco Public Utilities
20 Commission -- the San Francisco Planning Department,
21 whom I represent, is the lead agency for implementation
22 of the California Environmental Quality Act.

23 So now I'll just give you an overview of what
24 our project environmental impact report or EIR is going
25 to do. As prescribed in the Notice of Preparation or

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1 NOP, which you may have received -- and if you don't
2 have a copy and want one, please let me know, and I can
3 get one to you -- the San Francisco Planning Department
4 is going to prepare an environmental impact report on
5 this project, because we have identified several
6 potentially significant environmental effects that need
7 to be analyzed and disclosed in that form, that
8 document. And the EIR is the document that we'll use to
9 disclose the physical environmental effect of the
10 Calaveras Dam Replacement Project and also identify ways
11 to avoid or reduce the environmental effect.

12 The project's sponsor -- in this case, the San
13 Francisco Public Utilities Commission -- must consider
14 the results of the environmental impact report before
15 making a decision on the project. Before deciding
16 whether to modify the project or disapprove the project
17 or approve this project, this process must run its
18 course.

19 And also, as you may have read in the Notice
20 of Preparation, the Army Corps of Engineers will also be
21 preparing its own environmental assessment on the
22 project, in accordance with the National Environmental
23 Policy Act or NEPA. And that document is going to be
24 prepared at the same time that this environmental impact
25 report is going to be prepared. And it is our hope that

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1 that document and the document under the California
2 Environmental Quality Act will be a joint document, so
3 they will be coming out for your review at the same
4 time.

5 So just to give you an overview of this whole
6 process. After reviewing the project description
7 submitted by the PUC earlier this year, the San
8 Francisco Planning Department, again, as I mentioned
9 earlier, published a Notice of Preparation or NOP on the
10 24th of October. And that's just the official notice to
11 the public and to agencies that the project may have
12 significant environmental effects and that we're going
13 to be preparing an environmental impact report on the
14 project.

15 And we're conducting field studies and
16 technical studies now. And the draft EIR should be
17 published in 2007. At that time you'll have an
18 opportunity again to review this document, and we'll be
19 back here to solicit your oral comments and also written
20 comments, usually a 45-day review period. And then once
21 you submit your comments, we'll consider all of those
22 and respond to all of your comments in writing through a
23 response to comments document, which is also considered
24 together with the draft environmental impact report as a
25 final EIR.

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1 Then the San Francisco City Planning
2 Commission will consider certification of the
3 environmental impact report and -- through a
4 certification hearing. And then after that
5 certification hearing, the San Francisco Public
6 Utilities Commission will consider the findings in the
7 environmental impact report and consider whether to
8 approve, disapprove, or modify the project.

9 So now, Dave Rogers will -- from the San
10 Francisco Public Utilities Commission will just give you
11 a brief overview of the proposed project.

12 MR. ROGERS: Thank you and good evening. I'm
13 Dave Rogers, the project manager for the Calaveras
14 Replacement Dam Project.

15 I don't know how familiar you are with the
16 system, but we get 85 percent of our water from Hetch
17 Hetchy, which is -- originates in the Sierra Nevadas.
18 It comes through a series of pipelines and tunnels and
19 then bifurcates into two pipelines on the southern end
20 and two pipelines across the bay.

21 The local reservoir storage supplies only
22 15 percent of the total water supply for 2.4 million
23 people, but it is a very critical and important
24 15 percent, because of -- if a Hetch Hetchy outage
25 occurs, like we had several years ago -- you remember

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1 seeing in the newspapers a 150-foot high unplanned "Old
2 Faithful" geyser in the San Joaquin Valley, that was a
3 pipe break. And it took PUC several weeks to get those
4 repairs made. And with the Calaveras Dam being at a
5 restricted level, it was pretty touch-and-go to make our
6 water deliveries to those 2.4 million people.

7 There are four local reservoirs: San Andreas,
8 Upper and Lower Crystal Springs, San Antonio, and
9 Calaveras. Calaveras provides 40 percent of the local
10 storage.

11 To give you a little history -- I know it's
12 hard to see in this light. But the Calaveras Dam was
13 originally constructed as a hydraulic fill dam. This is
14 a photograph that was taken in 1913. And there -- it
15 was used -- the method of construction was to create two
16 berms, one upstream and one downstream, of fairly coarse
17 material: rocks, boulders, sand. And then in between,
18 slurry in -- hydraulically slurry in a clay and mud
19 material that would be the core, which would be the
20 impermeable material.

21 As you can see in this photograph, it was done
22 with mule teams. And in the background, that's a steam
23 shovel, the steam off the steam shovel. And this mule
24 team is depositing some of the coarse material in this
25 area, and the mule skinner is standing in where the clay

PUBLIC SCOPING MEETING -- SFPUC

1 would be.

2 Construction continued on for another five
3 years until they were about 25 feet from topping out at
4 a height of 225 feet. On a Thursday afternoon, they
5 started noticing some cracks on the upstream crest of
6 the dam. Friday, the cracks were still there. They
7 stopped all construction. They were just about -- like
8 I said, they were just about ready to top out.

9 And they called in the engineers and shut the
10 construction down over the weekend, and they came back
11 to this massive landslide failure. The upstream portion
12 of the embankment failed under its own weight,
13 dislodging about two-thirds of the embankment, knocking
14 over the intake tower, and covering the intake tunnel.

15 In 1918 they continued construction over most
16 of the landslide material. They changed the method of
17 construction slightly. Instead of placing so much
18 hydraulic fuel, they used rolled clay and continued the
19 construction up to where we see it now. If we could
20 have the lights off, please.

21 Everything was -- the dam performed fairly
22 well through the next 40 years. But in the late 60s,
23 early 70s, again, on the upstream bench, we noticed some
24 additional cracks, longitudinal cracks. And so we
25 performed an extensive investigation in engineering

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1 design. And the solution was to place these massive
2 rock buttresses both upstream and downstream of the
3 original dam to act as like bookcases, to stabilize this
4 mass.

5 In 1997, when we did some work on the intake
6 tower, we lowered the reservoir down to dead pool, which
7 was roughly 800 acre-feet. And at that time we noticed
8 that the piezometers, which are devices to measure
9 interior flow water pressure within the dam, they rose
10 immediately high because of lowering the reservoir,
11 which told us that the flow water pressure inside the
12 dam was building up. It wasn't able to drain off
13 naturally like you'd like it to. And it would have the
14 potential for destabilizing the dam, not quite in the
15 same manner as the one that originally failed, but a
16 similar failure.

17 So at that time we worked with the California
18 Division of Safety of Dams and determined that the
19 raising -- the normal pool was 556 feet, elevation 556.
20 We'd lower the reservoir another 50 feet, down to 706.
21 And by doing that, we'd allow ourselves the safety
22 factor, if during an earthquake the dam would deform, it
23 would only deform 25 or 28 feet, and we'd have some
24 safety factor there that it wouldn't fail
25 catastrophically like the original dam failed.

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1 Next, please. The main purpose of rebuilding
2 this dam is to rectify the current water storage. As I
3 mentioned earlier, with the -- with an outage of Hetch
4 Hetchy -- the system is very frail. The other three
5 reservoirs are actually pump back reservoirs. Calaveras
6 is the only reservoir that relies on a local water shed
7 to supply water by a gravity system.

8 Next. We looked at 12 different alternatives,
9 all the way from replacing or repairing the existing
10 dam -- which was environmentally not as preferred
11 because of the impacts of having to lower the reservoir
12 back down to the dead pool and not being able to
13 maintain the resident rainbow trout. And we looked at
14 different sizes and different construction
15 methodologies, different types of dams: rockfill,
16 earthfill, concrete based rockfill.

17 And the preferred alternative, both from an
18 environmental -- a minimization of the environmental
19 impacts and other factors for reliability and safety was
20 to replace the existing dam in kind and storage. In
21 other words, we will build a dam immediately downstream
22 of the existing dam that would have the same storage
23 capacity as the original dam, ninety-eight --
24 96,840 acre-feet, 97,000 acre-feet.

25 The dam is shown in plan view. This is the

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1 existing reservoir. This is the existing Calaveras Dam.
2 The new dam would be immediately downstream with a
3 curved open chute spillway. And this portrays the area
4 of disturbance, which would be various burrow areas,
5 disposal areas in the immediate vicinity of the new dam,
6 new replacement dam.

7 Next, please. The process of construction
8 would be to first remove the downstream face of the
9 existing dam, maintaining a slope that would still keep
10 this in a stable condition, and we would not destabilize
11 the existing dam. The water level would be kept at
12 the -- no more than the 706, 706 elevation. And the
13 reason we want to remove this material is we want the
14 new dam to start as close as we can to the old dam, to
15 avoid some landslide and other undesirable foundation
16 conditions further downstream.

17 The next step would be to construct a new
18 embankment dam. And this is a very robust design. And
19 I might add that all throughout the design process,
20 during the conceptual design, the California Division of
21 Safety of Dams has reviewed all of the work that's been
22 performed by URS, the design consultant, and will
23 continue to do so through the 35 percent, the 65, the
24 95, and the 100 percent design.

25 In addition, we have a prestigious advisory

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1 board of world class experts in dam design, earthquake
2 analysis, and other features that are important to this
3 project. That's called the Calaveras Technical Advisory
4 Committee. And likewise, they review everything as it
5 goes along.

6 So in this robust design, we have a very wide
7 clay core, an upstream impervious shell, downstream
8 impervious shell, and a very robust internal drainage
9 system, with rock armoring at the top for wave
10 protection. And like I said, it would be constructed
11 back to the same height as the original Calaveras Dam.

12 Next. The next -- the final stage -- or step
13 would be to -- the water would be at the 706 elevation.
14 It would be to take the top of the existing dam and move
15 that material, compact it in this area between the new
16 dam and the old dam, providing additional buttressing,
17 and then increase the water reservoir up to its maximum
18 historic height of 756 feet.

19 Next. So this is an artist's rendering, a
20 bird's eye view of what the new dam would look like with
21 respect to the old dam. For point of reference, this
22 would be the intake tower, which is located right now
23 there. All of this would be the new reservoir that
24 would come in up against the new dam. There would be an
25 open chute spillway, curved open chute spillway, to

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1 minimize the amount of cut and environmental impacts on
2 this embankment. And you can see, it's a much cleaner
3 and a much better improved earth embankment.

4 That's all I have. Let me turn it back to
5 Diana.

6 MS. SOKOLOVE: Thank you. So now we'd like to
7 hear from you. Again, we'd just like to receive your
8 comments on the environmental issues related to the
9 Calaveras Dam project. And for those of you who want to
10 speak tonight, I hope that you filled out a speaker
11 card, and hopefully I have all of those by now. And if
12 anyone else decides that you want to speak, feel free to
13 continue to submit your cards to Becky.

14 And just please note again that this is our
15 chance to hear from you and that this is not a
16 question-and-answer session. So we do want you to feel
17 as though you can ask us questions after the public
18 comment period is closed and of course throughout the
19 entire process.

20 So here are just some ground rules for
21 tonight's public comment session. Please, again, submit
22 your cards to speak. Wait until your name is called.
23 And I'll be calling folks in groups of three so that you
24 can get ready to speak next. Speak into the microphone,
25 and please state your name loud and clear for our court

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1 transcriber.

2 And please keep your comments limited to three
3 minutes. I know that most of you have more to share
4 than three minutes may allow, but just in the interests
5 of time, we hope that you consider your comments tonight
6 a verbal summary of your overall comments and that you
7 should feel free to submit supplemental comments, if you
8 have them. Our public involvement folks will keep track
9 of time and let you know when two minutes are up and
10 there's one minute left, so you can keep track of that
11 as well.

12 So the first three speakers are: Jeff Miller,
13 Nick Chapman, and Stan Garcia.

14 MR. MILLER: I'm Jeff Miller. I'm director of
15 the Alameda Creek Alliance. We submitted written
16 comments, but I'll try to summarize what our concerns
17 are.

18 I want to start off by saying the Creek
19 Alliance has been working since 1997 to restore Alameda
20 Creek, specifically focusing on returning steelhead
21 trout to the creek. We support the PUC's efforts to
22 have a reliable and a seismically safe system, water
23 supply system, including rebuilding Calaveras reservoir.

24 The major failing we see of the proposed
25 project right now is -- it looks like the engineering

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1 and technical aspects have been very thorough, and it's
2 time to bring in the biological considerations. And the
3 major failure we see is part of the purpose of this
4 project should be to restore some of the past impacts to
5 the fisheries of Alameda Creek and to include
6 restoration of steelhead trout in the purpose of the
7 project and put those elements into the design and the
8 whole project basically.

9 The project should also include -- it's not --
10 the project is not just rebuilding the dam; it's also
11 the operation of a reservoir. And so the project, the
12 EIR needs to assess the downstream impacts, as well as
13 the direct physical impacts.

14 Also, the operation of the Calaveras Diversion
15 Dam needs to be considered in this project, since that
16 dam is operated in coordination with the Calaveras Dam
17 and fills the reservoir.

18 The PUC impounds 86 percent of Upper Alameda
19 Creek flows that flow into the Sunol Valley. So this is
20 the major project that needs to address fisheries, this
21 is the pool of water for any steelhead restoration, and
22 this project absolutely needs to include that.

23 Some of the existing context of the project.
24 The current dam and reservoir have been operating in
25 violation of state wildlife protection laws. They block

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1 the best fish habitat and spawning habitat in the water
2 shed, and they also block the reservoir fish and ocean
3 run fish from the bay. The dam also impairs the
4 ecosystem functions, such as sediment transports,
5 downstream, scouring flows, and woody debris and other
6 impacts.

7 We'd like to propose that the project include
8 fish passage -- if feasible, include fish passage past
9 Calaveras Dam. And we've proposed either a bypass
10 canal, a fish ladder, or a trap and truck operation to
11 allow ocean run fish to get above the dam and reservoir
12 fish to get out to the bay.

13 Also, fish passage needs to be evaluated on
14 the diversion dam, and we're proposing that the EIR look
15 at scenarios of completely removing the dam or
16 reoperating the dam.

17 Also, the most important element is in stream
18 flows, and our written comments go into detail as to why
19 those flows are inadequate for steelhead restoration.
20 Thanks a lot.

21 MR. CHAPMAN: My name is Nick Chapman, Fire
22 Commissioner for Alameda County.

23 I aired concerns on October 11th concerning
24 the water system upgrade. This obviously is part of
25 that system also. The concerns that were aired were

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1 that in 1997 -- June 15, to be specific -- SFPUC entered
2 into an agreement to supply an updated water system
3 improvement plan for the town of Sunol. This is System
4 Number 0110012. Under that obligation, within two years
5 or three years that project was to be completed.

6 To date, the installation and upgrade of the
7 domestic water and the fire protection system has not
8 been completed, the contractual obligations have not
9 been met, and, to my understanding, the environmental
10 issues relative to the EIR at that time have not been
11 mitigated and completed.

12 And my concern is that the domestic water
13 supply is not up to state standards. You have not
14 completed the EIR commitment, nor the project
15 commitments from '97. How you can start two new
16 projects of upgrades without completing prior obligation
17 concerns me.

18 So for the record, I would like to have a
19 response. Again, my name is Nick Chapman, Fire
20 Commissioner, Alameda County, P.O. Box 230, Sunol,
21 California 94586. Thank you.

22 MR. GARCIA: I don't have much to say. My
23 name is Stan Garcia. I live at the west portal below
24 the dam.

25 My main concern is traffic on Calaveras Road.

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1 Truck traffic beyond me is going to raise heck with the
2 road. As far as my driveway, the road has been
3 reconstructed for trucks and gravel pits, but from there
4 on it's going to be downhill.

5 I don't think you're going to keep -- well,
6 you will -- if we have a winter like we had in '55 and
7 '57, your 40 percent won't stay. One of those two
8 years, the dam went from 40 foot below the spillway to
9 12 foot above overnight. They had 12, 15 inches of rain
10 above it.

11 Other than that, I don't -- my concern is
12 traffic. And other than that, that's it. I've been
13 around here all my life. Thank you.

14 MS. SOKOLOVE: Thanks. The next three
15 speakers are John Cant, Amy Fowler, and Susan Gearhart.

16 MR. CANT: Yes. My name is John Cant. I live
17 here in Fremont. And by interesting coincidence, I live
18 right at the mouth of Niles Canyon. So when I look at
19 the ABAG website for who's going to get washed away in a
20 tsunami wall of water when -- not if -- the Calaveras
21 Dam fails, along with a few others, I'm interested in
22 this from a personal point of view.

23 Frankly, I find it astonishing that it's been
24 80 years this dam has been insufficient and inadequate,
25 and we're still sitting here talking about it.

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1 Let me emphasize that while my concern is
2 personal for my own livelihood, I don't want to see the
3 environment messed up by dam reconstruction. It is
4 obviously necessary. And preferably the environment
5 would be improved in ways that Jeff Miller, much more
6 knowledgeably than myself, has been explaining.

7 But let me try to put this in a long-term
8 context. Having had some experience in large
9 administrative organizations, I'm familiar with a
10 phenomenon that importance expands to fill whatever
11 opportunity is there. So the San Francisco Public
12 Utilities Commission is a very large and important
13 entity. The population is increasing in the Bay Area,
14 and everybody is using water.

15 So I would like to recommend or in fact
16 request that the Public Utilities Commission take a
17 leading role in water conservation. I'm not saying that
18 I expect the commission to go out of business. Nobody
19 is going to ask that. We all use water.

20 But in this City of Fremont, for example,
21 there really is no use of recycled water as I understand
22 it. When I water my lawn or my organic garden, I'm
23 using water perhaps stored in the Calaveras reservoir.
24 That's absurd.

25 I realize the City of Fremont should take a

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1 much more important role in these things and other
2 entities, and Alameda County is doing something about
3 recycled water. But given the size and the prominence
4 and the importance, however one might say it, of the
5 Public Utilities Commission, it would seem to me that
6 they are very well situated to take the leading role in
7 this.

8 That to me is a much larger context, which is
9 not to belittle everything that's being said about the
10 details of the reconstruction of the dam in an
11 environmentally sensitive way. Thank you.

12

13 MS. FOWLER: I'm Amy Fowler, Santa Clara
14 Valley Water District. I would like to make a couple
15 brief comments tonight.

16 One is that we support San Francisco PUC to
17 ensure that in your replacement construction of the new
18 dam, that you continue to include design elements that
19 would enable in the future for potential enlargement of
20 the dam as specified in the San Francisco PUC Water
21 System Improvement Program. I did not see that
22 provision in the scoping NOP, so I would like to request
23 that that consistency be provided.

24 And I would also like to make a general
25 comment that I think it is important not only for the

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1 PUC to preserve this storage that you historically have,
2 but to look for opportunities to expand storage in the
3 San Francisco PUC Regional Water System and in the Bay
4 Area region. And I think everyone in California knows
5 that more storage is really needed for water system
6 flexibility, as well as to allow you to better manage
7 the wet period and wet year supplies, so that you can
8 carry it over for the dry years, when there is limited
9 amount of water available and competition is very keen.

10 I believe that this sound management using
11 storage is of benefit to the environment as a whole.
12 Maybe it has kind of footprint impacts, but you have to
13 also look at the big picture in terms of what the San
14 Francisco PUC's dry year actions could create in terms
15 of impacts to others around the state. Thank you.

16 MS. GEARHART: Hello. My name is Susan
17 Gearhart. I think that the San Francisco PUC has sort
18 of overgrown itself quite a bit. I know that you have
19 in your Water System Improvement Program that you take
20 concerns and comments into consideration from BOWSCA,
21 which is 28 water users, but you, yourselves make all
22 the decisions. You have all the authority.

23 I know that the Parsons report came out, and
24 you're up now to \$5 billion. 715 is coming from San
25 Francisco, and 4 billion from the rest of us water

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1 users. I know that Ibbs' report, that they said that
2 the environmental consultants were not being utilized
3 and that there were a lot of concerns that environmental
4 lawsuits could prolong the scheduling and could increase
5 the cost.

6 And I certainly support Jeff Miller in his
7 concepts that the dam replacement project include
8 adequate water use resources for the Calaveras reservoir
9 to restore steelhead trout in Alameda Creek below the
10 dam, fish passages for migration of fish past the dam,
11 and removal of the Alameda Diversion Dam.

12 I would hope that you would change your set-up
13 and allow the water users that are paying for this
14 project to be part of the authority making decisions.
15 Thank you.

16 MS. SOKOLOVE: James Swofford.

17 MR. SWOFFORD: My names is James Swofford.
18 I'm an Alameda county resident.

19 I'm a little disappointed with the
20 presentation. I was hoping to see a little more detail
21 on the project than just the construction of the dam
22 itself. Previous speakers have talked about the effect
23 of water release and downstream effects.

24 And I would like to get into the EIR as early
25 as possible consideration of the historic elements that

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1 are downstream. There are specifically three railroad
2 bridges. Two of them have been identified as qualifying
3 for the National Register. Those are both owned by
4 Alameda County Public Works as part of the Alameda
5 County Transportation Corridor. One was constructed in
6 1896, and the other in 1906. And the footings for both
7 dams are the pile and pier type that washed out in San
8 Bernardino County last winter in the heavy rains there.
9 So any extended or abnormal water release could have the
10 same potential effect on these two bridges.

11 The third bridge is owned by Union Pacific
12 Railroad. It was constructed in 1908. It is of a
13 similar type of pile and pier construction.

14 So please make sure that those transportation
15 elements get reviewed in the EIR.

16 MS. SOKOLOVE: Vinnie Bacon.

17 MR. BACON: I'm Vinnie Bacon with the Sierra
18 Club. Our main concern is that if the dam is
19 potentially going to be enlarged, we feel that that
20 needs to be included in the environmental impact report.
21 I mean, if we're talking about potentially expanding it,
22 then the environmental impact report should study the
23 effect of expanding it. We're concerned that this is
24 kind of being left as an open potential improvement
25 without studying the ramifications of increasing that.

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1 We're very concerned that the enlargement of
2 the dam would harm habitat for a number of endangered
3 species there, such as the red-legged frog, the tiger
4 salamander, and the Alameda whip-snake.

5 And secondly, I'd just like to say also we are
6 very much in favor of the plans recommended by Jeff
7 Miller and the Alameda Creek Alliance. Thank you.

8 MS. SOKOLOVE: Does anyone else want to speak
9 tonight?

10 MS. DOREMUS: Well, maybe I should. I'm a
11 resident across -- I'm Dorothy Doremus. I'm a resident
12 across the street, Delta Road, from the present dam and
13 reservoir. I've been there for about 27 years.

14 I've watched them fish the airplanes out that
15 had gone down 20 years before, and I know a lot of
16 things occur. I would be very aware of the danger of
17 fire from the actions that are taken to build this new
18 dam. I presume you're going to take all of the
19 necessary precautions, and I hope so. Because any
20 mechanical things that strike on rocks can set us all
21 ablaze up there.

22 I'd also like to ask, in front of my property,
23 a new development is going in of 17 homes. And we've
24 been pretty disturbed where we are because we have
25 inadequate water. And we have no means other than wells

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1 of getting water. So we're wondering if there's some
2 way that we would be included in this disbursement? As
3 we are not residents of Milpitas, we are residents of
4 the county, and Milpitas does not provide our water or
5 any other services. And no one does. We have a
6 volunteer organization.

7 So I just would like to make sure that you're
8 going to give some consideration, because it does little
9 good to look over and see a wealth of water and know
10 that you're having to turn off your faucet because it's
11 not been coming out. Thank you.

12 MR. GORGES: May I speak?

13 MS. SOKOLOVE: Yeah. Would you mind filling
14 out a speaker card real quick?

15 Okay. Please step up to the microphone and
16 state your name.

17 MR. GORGES: My name is Dave Gorges. I live
18 in Union City. And I have seen the steelhead trying to
19 make it up Alameda Creek every winter, and I think
20 the -- PUC needs to allow restoration of the steelhead
21 and take that into account before you build any new
22 dams. Thank you.

23 MS. SOKOLOVE: Okay. Thank you. Anyone else?

24 Okay. Well, thank you for coming tonight, and
25 thanks to everyone who spoke.

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1 That ends the public comment portion of the
2 meeting. If you came in late, please be sure to sign in
3 at the registration table, so that we may add you to the
4 distribution list for the project.

5 And just before we end, a few key points I
6 want to remind you of. The comments that we receive
7 tonight and the ones in writing through the 30th of
8 November will be considered while we're determining the
9 scope and focus of the environmental impact report for
10 this proposed project.

11 And you do have several opportunities for
12 additional input throughout the process. Namely, when
13 we publish the draft environmental impact report and
14 also the final environmental impact report.

15 Where you can send your comments is up on our
16 screen here. Please send them to the San Francisco
17 Planning Department, to the attention of Paul Maltzer,
18 who is the environmental review officer for the planning
19 department. If you do send them over email, you can
20 send them to me. My email address is up on the screen
21 here.

22 And if you have any questions or comments
23 concerning the environmental review process or this
24 environmental impact report, please get in touch with
25 me. I'd be happy to talk to you about it. Questions

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1 about the project specifically can be directed to the
2 Public Utilities Commission, either Dave or Betsy or
3 Craig.

4 That wraps things up. Thank you for coming
5 tonight and have a good evening.

6 (Time noted: 7:19 p.m.)

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8 I, MELISSA ROEN WILLIAMS, a Certified Shorthand
 9 Reporter in and for the State of California, hereby
 10 certify that the foregoing is a full, true, and correct
 11 transcript of this Public Scoping Meeting; that I
 12 reported the same in stenotype to the best of my
 13 ability, and thereafter had the same transcribed as
 14 herein appears.

15

16 _____, 20____, _____
 Date Melissa Roen Williams, CSR 12284

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SAN FRANCISCO PUBLIC UTILITIES
CALAVERAS DAM REPLACEMENT PROJECT
PUBLIC SCOPING MEETING
SAN FRANCISCO STATE UNIVERSITY
425 MARKET STREET, ROOM 301
SAN FRANCISCO, CALIFORNIA

TUESDAY, NOVEMBER 15, 2005
6:30 O'CLOCK P.M.

REPORTED BY: DEBORAH FUQUA, CSR#12948

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A P P E A R A N C E S

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DIANA SOKOLOVE

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Senior Environmental Planner

6

San Francisco Planning Department

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DAVID ROGERS

10

CRAIG FREEMAN

11

BETSY LAUPPE RHODES

12

San Francisco Public Utilities Commission

13

14

SHARON KYLE

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Davis & Associates - Communications

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P U B L I C S P E A K E R S

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Jeff Miller

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1 Tuesday, November 15, 2005 6:33 o'clock p.m.

2 ---o0o---

3 MS. SOKOLOVE: Hi, good evening. Welcome to
4 tonight's public scoping meeting for the Calaveras Dam
5 Replacement Project. My name is Diana Sokolove. I'm
6 the senior environmental planner with the San Francisco
7 Planning Department, and I'll be the moderator for
8 tonight's meeting.

9 I'd also just like to introduce a couple key
10 folks who are working on the project.

11 Dave Rogers is the project manager for the San
12 Francisco Public Utilities Commission. Craig Freeman is
13 the environmental project manager for the project, also
14 with the San Francisco Public Utilities Commission. And
15 Betsy Lauppe is with communications, also with the
16 Public Utilities Commission or PUC.

17 And I just want to explain the purpose of the
18 meeting for those of you who may be unfamiliar with the
19 environmental review process.

20 We're here tonight to hear your comments on the
21 scope and focus of the project environmental impact
22 report, or EIR, for the Calaveras Dam Replacement
23 Project. This is your opportunity to assist the
24 Planning Department in determining the scope and focus
25 of the EIR and also to help us identify any significant

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1 environmental effects that may occur with implementation
2 of the proposed project and, of course, alternatives and
3 mitigation measures.

4 We're really here tonight to listen to your
5 comments. This isn't a question-and-answer session, so
6 please hold your comments until we get to the public
7 comment portion of meeting.

8 Here is our meeting agenda. We'll give a brief
9 presentation, including an overview of the environmental
10 review process, and Dave Rogers with the PUC will give
11 an overview of the Calaveras Dam Replacement Project.
12 We'll take some public comments, and then we'll wrap up
13 the meeting.

14 So just before I get to the presentation, a few
15 housekeeping items: Hopefully you signed in when you
16 came in, legibly, so that we can keep in touch with you
17 throughout this process and mail you all kinds of
18 letters and things like that.

19 And also, if you plan on speaking, please fill
20 out a speaker card -- looks like this -- on the table
21 over here (indicating). And I'll be reading off of
22 those to bring folks up to talk later tonight. Another
23 item you may wish to pick up is a comment form. If you
24 don't want to speak tonight but you'd like to submit
25 written comments, you can fill out the comment form also

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1 on the table when you first walk in. And just drop them
2 off in the comment box. And of course, you can submit
3 your comments by fax or e-mail or regular mail through
4 November 30th close of business, 2005.

5 Just a couple of additional housekeeping items:
6 Restrooms are out the door and to the right, and then
7 they'll be right on your left. And if you could kindly
8 turn off your cell phones and pagers so that we're not
9 interrupted during the meeting. If you need to make a
10 call, please do so outside.

11 So I'll just give you a little bit of
12 background on the environmental review process. And
13 again, please hold your comments until after we get
14 through the presentation.

15 The environmental review process, also known as
16 the California Environmental Quality Act process, or
17 CEQA process, is intended to produce informational
18 documents about a project's potential environmental
19 effects. And so again, the main reason why we're here
20 tonight is to get your comments on potential
21 environmental effects that may occur with implementation
22 of the proposed project.

23 For a project sponsored by the City of San
24 Francisco within the City of San Francisco and outside
25 of the City of San Francisco, the San Francisco Planning

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1 Department is the lead agency under the California
2 Environmental Quality Act. So the Planning Department
3 is the agency responsible for implementing CEQA.

4 And what will the EIR do? Well, as described
5 in the notice of preparation, the EIR will disclose the
6 physical and environmental effects of the proposed
7 project and, again, identify ways to avoid, reduce, or
8 mitigate those environmental effects and suggest
9 alternatives to the proposed project. And the project
10 sponsor, in this case, the San Francisco Public
11 Utilities Commission, must consider the results and the
12 findings in the environmental impact report before
13 making a decision on whether to approve, modify or
14 disapprove a project.

15 And as you may have read in the notice of
16 preparation, the Army Corps of Engineers is also
17 preparing its own environmental assessment of the
18 project and, in accordance with the National
19 Environmental Policy Act, may prepare a joint
20 environmental document with this environmental impact
21 report. But in any case, the two documents are being
22 prepared parallel.

23 So just to give you a brief overview of the
24 whole process, we -- my department received a
25 description of the project, and -- earlier this year,

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1 and we prepared this notice of preparation just to let
2 folks know that we will be preparing an environmental
3 impact report on the project. And we're conducting
4 technical studies and field studies throughout 2006. We
5 hope to publish a draft in 2007, and then we will
6 release the draft to the public. You'll have some time
7 to comment on the draft. We will take all of your
8 comments under consideration and respond to each one in
9 a document called the "Response to Comments Document."

10 And that response to comments document,
11 together with the draft environmental impact report, is
12 considered the final environmental impact report that
13 comes up for certification at the San Francisco City
14 Planning Commission hearing. After certification, the
15 San Francisco Public Utilities Commission will consider
16 whether to adopt the project but only after
17 certification.

18 So now Dave Rogers with the San Francisco
19 Public Utilities Commission will just give a brief
20 overview of the project.

21 DAVID ROGERS: Thank you, Diana.

22 Good evening. I don't know how familiar you
23 are with the project, but let me give a little
24 introduction on how Calaveras Dam fits into the overall
25 Hetch Hetchy system. The Hetch Hetchy delivers water

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1 through a series of pipelines and tunnels that connect
2 to Sierra Nevada reservoirs and then bifurcates into two
3 tunnels -- South Bay and across, Transbay, pipelines --
4 and feeds into, effectively, three terminal storage
5 reservoirs: San Andreas, Upper and Lower Crystal
6 Springs, and San Antonio. Those are the reservoirs that
7 are plumbed to receive Hetch Hetchy water.

8 Calaveras Reservoir is a gravity-feed into the
9 system and is not plumbed to receive Hetch Hetchy water.
10 It receives water from the local watershed, as does San
11 Antonio. Although the Hetch Hetchy system delivers 85
12 percent of the water to San Francisco, the remaining 15
13 percent is extremely important during a Hetch Hetchy
14 outage.

15 Similar to what we had several years ago, if
16 you remember this, in the newspapers, this large geyser
17 in the San Joaquin Valley was a pipe break that, because
18 of some problems with the guard valve closing and other
19 sorts of things, it took the PUC quite some time to make
20 those repairs. And during that interim, because of the
21 restricted reservoir levels of Calaveras, the delivery
22 to the 2.4 million customers in the Bay Area -- it was
23 extremely close and tight to make those deliveries in
24 time.

25 A little bit of history about how the Calaveras

1 Dam was originally constructed, which gives a backdrop
2 on why we're doing this work -- it's a hydraulic-fill
3 dam. And in this photograph, which is about 1913, when
4 they were first starting, it was constructed by mule
5 teams and steam shovels. You can see the mule teams
6 here. There's a mule skinner in the center part.

7 And in this picture, it shows them depositing
8 the coarse materials in the outer berms on both sides --
9 this would be upstream, and this would be downstream
10 (indicating) and, then, in between, the hydraulically
11 placed clay-sized material -- mud, clay, and slurry --
12 and then that drained out through the coarse dams on
13 each side.

14 And they built the dams, these berms, like
15 pyramids up the side on both cases and then continued to
16 slurry in the clay material from the impermeable zone.
17 They got within 25 feet of topping out the
18 construction -- the total height of the dam was 225
19 feet. And at that time, that was the highest
20 earth-filled dam in the world.

21 On a Thursday -- it started on a Thursday
22 afternoon, and on Friday, some workers noticed some
23 longitudinal cracks along the crest of the dam. And so
24 they stopped construction, pulled everybody off, and got
25 together with their engineers trying and figure out what

1 they should do.

2 And they came back Monday, that Monday morning,
3 and this is what they found (indicating). Almost
4 two-thirds of the embankment had sloughed off or
5 landslid into the reservoir upstream, knocking over the
6 intake tower, covering the intake tunnel, and causing
7 this failure that you see in 1918.

8 So they continued to -- they tried to recover
9 as much as they could. They removed some of the soft
10 material, and they continued the construction. But they
11 changed the construction methodology a little bit. They
12 still used some hydraulic fill, but then they introduced
13 rural clay for the impermeable zone.

14 The dam performed as designed for a number of
15 years, approximately 40 years. And then, in the late
16 '60s and early '70s, again, there were some cracks,
17 longitudinal cracks, that were noticed on one of the
18 upstream berms. And so extensive evaluations,
19 geotechnical investigations determined that additional
20 strengthening of the embankment was required.

21 And so two rather massive rock-filled
22 buttresses, one downstream and one upstream, which is
23 covered by water here, were placed to act as bookcases
24 to hold the interior of this older mixed-construction
25 hydraulic-filled dam.

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1 That was fine until 1997, when some repairs
2 were conducted on the intake tower, and the water in the
3 reservoir was lowered down to nearly the dead pool,
4 which is, like, 800 acre-feet. And at that time the
5 pizometers, which are devices to measure water pressure,
6 internal water pressure within the dam, started rising
7 and rising, which told the engineers that there's no
8 internal drainage, and this is a very risky condition
9 for rapid draw-down during an earthquake.

10 And that stimulated the current investigation,
11 again, some additional geotechnical evaluations,
12 reassessment of the causative fault. And then in 2001,
13 the PUC, with the Division of Safety of Dams, California
14 Division of Safety of Dams, lowered the water level 50
15 feet from the normal pool of 756 to 706. And the reason
16 for that 50 feet is because it was determined that
17 during an earthquake -- which, the causative fault is in
18 this little inlet, the Calaveras fault -- this
19 embankment, even though it's been reinforced with rock
20 fill, would deform approximately 20, 28 feet, allowing
21 for another 20 feet of factor of safety of freeboard.

22 So even if there was a large earthquake, by
23 lowering the reservoir to this level, it still would not
24 catastrophically fail and breach like it did in 1918.

25 So really the driving factors are, here, is the

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1 safety and reliability and the urgency. And
2 particularly the urgency -- like I noted before, the
3 crisis that we had when we had a pipe break in the Hetch
4 Hetchy. Calaveras provides 40 percent of the local
5 storage. It's a very important reservoir within the
6 system.

7 This is an overview of the immediate area
8 around the dam. This is an existing embankment
9 (indicating). The new dam, replacement dam, would be
10 just immediately downstream. And there would be an
11 open-chute, curved spillway. The excavation and
12 foundation for preparation would be confined to this
13 immediate area, immediately downstream of the existing
14 dam (indicating).

15 There are several areas for both borrow and
16 disposal within the immediate area. There's
17 additional -- there's south, in the southern part of the
18 reservoir, which is shown on that middle drawing back
19 there, there's also another borrow area for the
20 clay-sized materials. Most of the materials that would
21 be placed here would be coarse-sized. And there would
22 be some reclaiming of the rock buttresses from the
23 existing dam.

24 So you can see the localized impact
25 environmentally of the construction of the dam would be

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1 restricted to the immediate area within the new
2 replacement dam. Now, we looked at 12 different
3 alternatives, all the way from repairing the existing
4 dam on up to building a much larger dam, up to 420,000
5 acre-feet and different types of construction -- rock
6 fill, earth fill, concrete-faced rock fill.

7 And through that whole process of evaluating
8 for reliability, seismic stability, constructability,
9 cost, and environmental impacts, the most reasonable and
10 preferred alternative would be to replace the current
11 storage of 97,000 acre-feet with a dam of the same size
12 immediately downstream and with an earth-filled
13 construction.

14 The steps in that construction process would
15 start off by first removing the downstream face of the
16 existing structure without destabilizing the existing
17 embankment, maintaining the water level in the reservoir
18 at the 706 to facilitate the maintenance of the resident
19 rainbow trout, and using the existing dam as a
20 cofferdam.

21 Next slide.

22 Then the construction would start with the
23 foundation preparation and building a -- an earthen
24 embankment; it's a zoned dam, an engineered zone dam
25 with upstream shell of coarse purulent [sic] materials

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1 and a downstream shell of coarse materials that are free
2 draining, an interior core with internal drainage, a
3 drainage blanket, and a bed of filtered material and
4 drainage out to capture any seepage that comes through
5 the embankment.

6 Now, this is a very robust design. It has a
7 much wider core; it has much wider shells and much
8 flatter slopes to accommodate both the maximum credible
9 earthquake and the probable maximum flood.

10 Next slide.

11 The final step would be to remove the top of
12 the existing cofferdam and place those materials in
13 between the existing dam and the new embankment and
14 compact them, and then, of course, bring the water level
15 back up to the 756 normal pool.

16 So this is an artist's rendering of what that
17 new embankment would look like. And for point of
18 reference, the intake tower, the existing intake tower,
19 would be replaced with a new intake tower about 80 feet
20 downstream of that, in this position (indicating).

21 This slope, the light-colored slope here, is
22 that slope. So you can see everything is -- the new dam
23 has just shifted downstream. And like I said earlier,
24 there's a curved spillway. And the reason it's curved
25 is to minimize the amount of cut in this embankment and

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1 environmental impacts resulting from that.

2 That's all I have.

3 Diane?

4 MS. SOKOLOVE: Now we want to hear from you. If
5 you do want to speak, hopefully you filled out a speaker
6 card. And please note that there are some ground rules
7 for the comment session.

8 Please, again, submit a speaker card to speak.
9 Wait until your name is called. And when you come up to
10 the microphone, speak into the microphone slowly and
11 state your name. And please keep comments limited to
12 three minutes.* Although you may have more to share,
13 please just consider these verbal comments a summary of
14 your overall comments. And you may, of course,
15 supplement your oral comments tonight in writing. And
16 we'll be keeping track of time. And of course, we have
17 a court transcriber here tonight, so we'll be officially
18 keeping notes for this meeting.

19 Jeff Miller?

20 JEFF MILLER: Hi. Jeff Miller, Director of the
21 Alameda Creek Alliance. You've heard from me last night
22 at the Fremont meeting. And I've submitted written
23 comments, so I'll keep it brief on a few key points.

24 I, just out of curiosity, kind of looked at how
25 long we've been interacting with the PUC on steelhead

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1 restoration in the Alameda Creek. And I realized this
2 month is 99 months this month since we've been asking
3 the PUC to restore steelhead to Alameda Creek. And this
4 project is a great opportunity to make that a reality.

5 So -- and again, we support the PUC bringing
6 their water system up to standard for reliability and
7 earthquake safety. And similarly we'd like to see this
8 project bring Alameda Creek up to standard in terms of
9 environmental laws and in terms of being able to restore
10 some of what was there previously.

11 So the key point is that this project, we
12 think, needs to be revised to include stewardship and
13 restoration elements. And a good example is the Sunol
14 and Niles Dam removal projects that the PUC will be
15 doing. The draft EIR for that has come out, and part of
16 the stated purpose of that project -- it's an
17 engineering project similar this. It's a dam removal in
18 that case. But one of the stated purposes is to allow
19 for migratory fish passage. And another stated purpose
20 is to minimize environmental impacts of the project.

21 And similarly, the Calaveras Dam rebuild needs
22 to have similar kinds of goals and purposes built into
23 the -- into the project. And of course, you know what
24 our, you know, opinions are on that: in-stream flow
25 suitable for steelhead restoration; looking at fish

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1 passage past the diversion dam and Calaveras Dam; and
2 looking at restoring some natural processes such as
3 sediment, fish-spawning gravels and some other
4 functions.

5 If these elements are put in the project, we're
6 going to have a project that we can support and
7 hopefully the permitting and construction will move
8 forward cooperatively and quickly. Thanks a lot.

9 MS. SOKOLOVE: Does anyone else want to speak
10 tonight?

11 (No response)

12 MS. SOKOLOVE: Okay. Well, thanks for speaking,
13 Jeff. And that ends the public comment portion of the
14 meeting.

15 And if you came in late, again, please be sure
16 to sign in at the registration table.

17 And the comments that we received tonight and
18 the ones we receive in writing through the end of
19 November we'll, of course, consider for writing the
20 draft environmental impact report.

21 And you do have several opportunities for
22 additional input after we publish the draft EIR and then
23 also when we put together the final. And if you wish to
24 further supplement your comments or want to get in touch
25 with us, here is some contact information for you.

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1 So that wraps things up.

2 Thanks for coming, and thanks for your input.

3 And have a great evening.

4 (Whereupon, the proceedings adjourned at

5 7:14 p.m.)

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1 STATE OF CALIFORNIA)
) ss.
 2 COUNTY OF MARIN)

3 I, DEBORAH FUQUA, a Certified Shorthand
 4 Reporter of the State of California, do hereby certify
 5 that the foregoing proceedings were reported by me, a
 6 disinterested person, and thereafter transcribed under
 7 my direction into typewriting and is a true and correct
 8 transcription of said proceedings.

9 I further certify that I am not of counsel or
 10 attorney for either or any of the parties in the
 11 foregoing proceeding and caption named, nor in any way
 12 interested in the outcome of the cause named in said
 13 caption.

14 Dated the 1st day of December, 2005.

15

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17 DEBORAH FUQUA

18 CSR #12948

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F. MEETING SUMMARY MINUTES FROM INTER-AGENCY SCOPING MEETING

SFPUC Calaveras Dam Replacement Project
Case No. 2005.0161E

Public Scoping Report
Davis & Associates/ETJV



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MEMORANDUM

Draft January 25, 2006

Final March 31, 2006

TO: Diana Sokolove, EIR Coordinator

FROM: Barbara W. Sahm

SUBJECT: **Calaveras Dam Replacement Project**
Interagency Scoping Meeting Notes

A scoping meeting was convened on December 15, 2005, at the San Francisco Planning Department with representatives of various state and federal agencies to discuss the scope of the CEQA and NEPA documents for the SFPUC's Calaveras Dam Replacement Project. This meeting was a follow up to a mailed Notice of Preparation and two public scoping meetings that were held in November in Fremont and San Francisco. A copy of the agenda for the Interagency Scoping Meeting is attached at the end of this memorandum.

Attendees

Mike Monroe, USEPA
Gary Stern, NMFS
Kristine Atkinson, CDFG
Bob Smith, USACE

Diana Sokolove, MEA
Craig Freeman, SFPUC
Janice Hutton, SFPUC
David Rogers, SFPUC
Tim Ramirez, SFPUC
Mark Winsor, ETJV
Leo Edson, ETJV
Barbara Sahm, ETJV

Representatives from the USFWS and San Francisco Bay RQWCB were invited to the meeting but were unable to attend. A copy of the sign-in list is attached at the end of this memorandum.

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Presentation

Diana Sokolove presented the purpose of the meeting and summarized the CEQA public scoping process that has been held for the Calaveras Dam Replacement Project.

David Rogers summarized the proposed project and alternatives studied by the engineering team, and provided a status update on the design process for the project.

Summary of Issues Raised

- Water release for fish, and temperature of water
- Minimize impacts on fish, including fish screens at new adit and on diversion dam
- Reservoir storage capacity and the amount needed
- Alameda Creek diversion dam relationship to project
- Level of NEPA review
- Alternatives, including larger dam?
- Recapture of released water not part of project
- Relationship to SFPUC's Turner Dam and San Antonio Reservoir
- Need for flow studies in Alameda Creek
- Funding for federal and state staff participation in review

Details of Discussion

Is temperature control for water release for fish constrained by the volume of the cold water pool? (NMFS) Answer from SFPUC is that the lower adit (intake) is close to the bottom of the cold water pool; City staff are examining limnology data to determine whether the volume of the cold water pool is adequate for releases both prior to completion of the replacement dam and during future operation (post-construction).

Is current storage capacity at 705 feet (DSOD-restricted maximum) sufficient for pre-construction releases? (USEPA) Answer from SFPUC is that the SFPUC would not be able to meet its water supply obligations with the current storage capacity.

Are there provisions to increase storage to 360,000 AF? (USEPA) SFPUC answered that the proposed wider core will allow the replacement dam to be used as part of a larger dam if ever one was proposed at the site. Also, the watershed does not produce a volume of water consistent with a much larger

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reservoir. MEA added that the SFPUC's Water System Improvement Program (WSIP), which constitutes SFPUC's plans for storing and delivering water to its customers through 2030, does not include plans for a dam larger than the one currently proposed.

Why is an area identified for spoils disposal that could reduce the size of the reservoir? (USEPA) SFPUC answered that the disposal area in question will be considered for removal from consideration during the next phase of project design.

Is the Alameda Creek diversion dam being evaluated as part of the project? (USEPA) Following a brief discussion of the operation of the diversion dam, MEA answered that the EIR will consider the construction and operation of Calaveras Dam, which includes operation of the diversion dam; however, because no change is proposed in the diversion dam's operation, no direct project effects are anticipated. SFPUC added that if the study being conducted by URS of fish passage opportunities raises new issues, this could change.

The Biological Opinion and Biological Assessment must address the diversion dam and its relationship to the Calaveras Dam Replacement Project, and include terms and conditions to minimize "take" such as fish screens. (NMFS)

Ongoing management and use of the diversion dam brings in California requirements such as Fish & Game Code §§ 5901 and 5937. Because the replacement dam will require active management Sections 1601 and 1602 are also applicable. (CDFG) MEA noted that these issues are different from those establishing what is covered in a CEQA document.

What level of NEPA document is expected? (USEPA) Bob Smith of the USACE, the NEPA Lead Agency, responded that the new impacts to Waters of the U.S. are mainly in the area downstream (i.e., new dam footprint), below the existing dam, and an EIS is not expected. Preliminary review of the delineation suggests that the permanent impact would be less than 10 acres. Within the reservoir, the project would disturb about 56 acres that will be returned to Waters of the U.S. when the reservoir is restored to its original inundation area. NMFS representative expressed concern about an EA, and noted that the public may see jurisdiction wider than the Corps has.

Alternatives suggested in public scoping and under consideration for the EIR were described by Ms. Sokolove: An expanded dam and reservoir were requested by Restore Hetch Hetchy and BAWSCA; approaches to maintaining habitat and enhancing ecosystems were requested by Alameda Creek Alliance

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Advisory Committee, and that information from that effort should be used to establish flow requirements below the Calaveras Dam. City staff noted that there is not yet agreement on a scope of work for these studies, and a consultant has not been selected, so the work may not begin in 2006, likely precluding the opportunity to include such work in the Draft EIR. In addition, Mr. Stern noted that because of the recent NMFS ruling regarding Central California Coast steelhead Distinct Population Segment (DPS), an ESA Section 7 would not be appropriate or required for the Calaveras Dam Replacement Project.

Mr. Stern also noted that information on available habitat will be needed, and he believes that much of this information has not yet been collected. He also noted that an operations plan must be analyzed in the EIR. Timing is difficult, because NMFS should be involved in review of the passage flow information from URS|SWRI, but funding will not be available until sometime after July 2006. There was a discussion of staffing and agency review of information during spring and summer of 2006. The City advised it will work with interested agency staff to participate in upcoming passage studies, habitat characterization, and other fisheries-related field work.

Appendix C

Vegetation and Wildlife Survey Reports

Appendix C.1

Special Status Plant and Animal Species Evaluated in the Calaveras Dam Replacement Project Draft EIR

Special-Status Plant Species Known or Potentially Occurring in the Calaveras Dam Replacement Study Area

Species	Status ¹			Habitat	Potential for Occurrence
	USFWS	CDFG	CNPS		
Bent-flowered fiddleneck <i>Amsinckia lunaris</i>	—	—	1B.2	Coastal bluff scrub, cismontane woodland, valley and foothill grassland from 3 to 500 meters in elevation.	Could occur; suitable woodland and grassland habitat present in study area but no plants were found during detailed botanical surveys. Only occurrence in 9-quad search is approx. 9.5 miles southeast of study area (obsvd 1998).
Alkali milk vetch <i>Astragalus tener</i> var. <i>tener</i>	—	—	1B.2	Valley grasslands, alkali sink, freshwater wetlands, and wetland-riparian habitats on alkali soils from 0 to 60 meters in elevation.	Not expected to occur; there is no suitable alkaline habitat present in the study area and no plants were found during detailed botanical surveys. Closest occurrence in CNDDB approx. 4 miles southwest of study area (obsvd 1905).
Brittlescale <i>Atriplex depressa</i>	—	—	1B.2	Chenopod scrub, meadows and seeps, playatas, valley and foothill grassland, and vernal pools in alkaline habitats and clay soils from 1 to 320 meters in elevation.	Not expected to occur; there is no suitable alkaline habitat present in the study area and no plants were found during detailed botanical surveys. Only occurrence in 9-quad search is approx. 7 miles west of study area in alkaline vernal pool grassland (obsvd 2003).
San Joaquin spearscale <i>Atriplex joaquiniana</i>	—	—	1B.2	Alkali meadow, chenopod scrub, seeps in valley and foothill grassland, often in seasonal alkali wetlands or alkali sink scrub, from 1 to 835 meters in elevation.	Not expected to occur; there is no suitable alkaline habitat present in the study area and no plants were found during detailed botanical surveys. Closest occurrence in 9-quad search is approx. 3 miles east of study area (obsvd 1896). 2001 occ. 8 miles east of study area.
Big-scale balsamroot <i>Balsamorhiza macrolepis</i> var. <i>macrolepis</i>	—	—	1B.2	Chaparral, cismontane woodland, and valley and foothill grassland, sometimes in serpentine soils, from 90 to 1,400 meters in elevation.	Could occur; suitable woodland and grassland habitat present in study area but no plants were found during detailed botanical surveys. Only occurrence in 9-quad search is approx. 9 miles south of study area. (obsvd 1999).
Chaparral harebell <i>Campanula eximia</i>	—	—	1B.2	Rocky, usually serpentine, substrates in chaparral habitat; 300 to 1,250 meters in elevation.	Could occur; suitable serpentine habitat present; however, study area is at low end of species known elevation range. No plants were found during detailed botanical surveys. Closest occurrence in 9-quad search is approx. 4 miles northwest of study area (obsvd 1973).

Special-Status Plant Species Known or Potentially Occurring in the Calaveras Dam Replacement Study Area (Continued)

Species	Status ¹			Habitat	Potential for Occurrence
	USFWS	CDFG	CNPS		
Pappose tarplant <i>Centromadia parryi</i> ssp. <i>congonii</i>	—	—	1B.2	Valley and foothill grassland with alkaline soils from 1 to 230 meters in elevation.	Not expected to occur; there is no suitable alkaline habitat present in the study area and no plants were found during detailed botanical surveys. Closest occurrence found in 9-quad search approx. 4 miles southwest of study area in saline soils (obsvd 1998).
Robust spineflower <i>Chorizanthe robusta</i> var. <i>robusta</i>	E	—	1B.1	Sandy or gravelly substrates in cismontane woodland openings, coastal dunes, or coastal scrub from 3 to 300 meters in elevation.	Could occur; suitable woodland habitat present in study area but no plants were found during detailed botanical surveys. Only occurrence found in 9-quad search is from 1882, approx 4 - 13 miles southwest of study area. Possibly extirpated since 1882.
Mt. Hamilton thistle <i>Cirsium fontinale</i> var. <i>campylon</i>	—	—	1B.2	Serpentine seeps in chaparral, cismontane woodland, and valley and foothill grassland from 100 to 890 meters in elevation.	Could occur; suitable woodland and grassland habitat present in study area but no plants were found during detailed botanical surveys. Closest occurrences found in 9-quad search approx. 10 miles south of study area (obsvd 2001).
San Francisco collinsia <i>Collinsia multicolor</i>	—	—	1B.2	Closed-cone coniferous forest or coastal scrub, sometimes in serpentinite soils, from 30 to 250 meters in elevation.	Could occur; marginal suitable coniferous forest habitat is present in study area but no plants were found during detailed botanical surveys. Only occurrence in 9-quad search is historic and approx. 11.5 miles south of study area (date obsvd unkn, prior to 1961).
Point Reyes bird's-beak <i>Cordylanthus maritimus</i> ssp. <i>palustris</i>	—	—	1B.2	Coastal Salt Marsh.	Not expected to occur; there is no suitable salt marsh habitat present in the study area. The closest occurrence in 9-quad search is assumed extirpated & approx. 7 miles southwest of study area (obsvd 1905).

Special-Status Plant Species Known or Potentially Occurring in the Calaveras Dam Replacement Study Area (Continued)

Species	Status ¹			Habitat	Potential for Occurrence
	USFWS	CDFG	CNPS		
Mt. Hamilton coreopsis <i>Coreopsis hamiltonii</i>	—	—	1B.2	Rocky sites in cismontane woodland from 550 to 1,300 meters in elevation.	Not expected to occur; suitable woodland habitat present; however, the study area is lower than species' known elevation range. The closest occurrence in 9-quad search is approx. 5.5 miles northeast of study area (obsvd 1994).
Hospital Canyon larkspur <i>Delphinium californicum</i> ssp. <i>interius</i>	—	—	1B.2	Openings in chaparral habitat or mesic sites in cismontane woodland from 230 to 1,095 meters in elevation.	Could occur; suitable woodland habitat present in study area but no plants were found during detailed botanical surveys. The only occurrence in 9-quad search is historic & approx. 9 miles northeast of study area (obsvd 1928).
Santa Clara Valley dudleya <i>Dudleya setchellii</i>	E	—	1B.1	Rocky serpentinite sites in cismontane woodland and valley and foothill grassland from 60 to 365 meters in elevation.	Could occur; suitable woodland and grassland habitat present in study area but no plants were found during detailed botanical surveys. Several occurrences in 9-quad search approx. 10 miles south of study area (obsvd 2001).
Ben Lomond buckwheat <i>Eriogonum nudum</i> var. <i>decurrens</i>	—	—	1B.1	Chaparral, cismontane woodland, lower montane coniferous forest - maritime (ponderosa pine sand hills in Santa Cruz County), from 50 to 800 meters in elevation.	Could occur; suitable woodland habitat present in study area but no plants were found during detailed botanical surveys. No occurrences in 9-quad search. Closest occurrence approx. 20 miles southwest of study area (obsvd 1953).
Hoover's button celery <i>Eryngium aristulatum</i> var. <i>hooveri</i>	—	—	1B.1	Vernal pools from 3 to 45 meters in elevation.	Not expected to occur; no suitable vernal pool habitat present and study area is higher than species known elevation range. No plants were found during detailed botanical surveys. Closest occurrence in 9-quad search is approx. 7 miles west of study area (obsvd 1996).

Special-Status Plant Species Known or Potentially Occurring in the Calaveras Dam Replacement Study Area (Continued)

Species	Status ¹			Habitat	Potential for Occurrence
	USFWS	CDFG	CNPS		
Fragrant fritillary <i>Fritillaria liliacea</i>	—	—	1B.2	Cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland, often in serpentine soils from 3 to 410 meters in elevation.	Could occur; suitable serpentine habitat present in study area; however, no plants were found during detailed botanical surveys. Two occurrences reported in 9-quadrant search, closest is historical (prior to 1941) approx. 2 miles south of study area. 2nd occurrence approx 10 miles south of study area (obsvd 2001).
Diablo helianthella <i>Helianthella castanea</i>	—	—	1B.2	Broadleaved upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, and valley and foothill grassland from 60 to 1,300 meters in elevation.	Known to occur; four occurrences of Diablo helianthella were found in cismontane woodland habitat in the study area. Only reported occurrence in 9-quadrant search is approx. 4 miles north of study area (obsvd 2003).
Loma Prieta hoita <i>Hoita strobilina</i>	—	—	1B.1	Mesic sites in chaparral, cismontane woodland, and riparian woodland, usually in serpentine soils, from 30 to 600 meters in elevation.	Could occur; suitable woodland and serpentine soils present in study area; however, no plants were found during detailed botanical surveys. No occurrences in 9-quadrant search, closest occurrence is approx. 16 miles south of study area (obsvd 2002).
Contra Costa goldfields <i>Lasthenia conjugens</i>	E	—	1B.1	Mesic sites in cismontane woodland, alkaline playas, valley and foothill grassland, and vernal pools from 0 to 470 meters in elevation.	Could occur; suitable woodland and grassland habitats with depressions; however, no plants were found during detailed botanical surveys. Closest occurrence in 9-quadrant search is approx. 7 miles west of study area (obsvd 2002).
Legenere <i>Legenere limosa</i>	—	—	1B.1	Vernal pools from 1 to 880 meters in elevation.	Not expected to occur; no suitable vernal pool habitat present in study area, and no plants were found during detailed botanical surveys. Only occurrence in 9-quadrant search is approx 6 miles northeast of study area (obsvd 1999).

Special-Status Plant Species Known or Potentially Occurring in the Calaveras Dam Replacement Study Area (Continued)

Species	Status ¹			Habitat	Potential for Occurrence
	USFS	CDFG	CNPS		
Woolly-headed lessingia <i>Lessingia hololeuca</i>			3	Broadleafed upland forest, coastal scrub, lower montane coniferous forest, valley and foothill grassland with serpentine soils from elevation 15 - 305 meters	Could occur ; suitable habitat present; however, no plants were found during detailed botanical surveys.
Mt. Hamilton lomatium <i>Lomatium observatorium</i>	—	—	1B.2	Cismontane woodland from 1,219 to 1,330 meters in elevation.	Not expected to occur ; suitable woodland habitat present; however, study area is lower than species' known elevation range. No plants were found during detailed botanical surveys. Closest occurrence in 9-quad search is approx. 11 miles southeast of study area located at 1219 meters elevation (obsvd 1993).
Arcuate bush mallow <i>Malacothamnus arcuatus</i>	—	—	1B.2	Gravelly alluvium in Chaparral from 80-355 meters.	Could occur ; marginal suitable habitat present; however, no plants were found during detailed botanical surveys. Closest occurrence is historic (date unkn, prior to 1936) and is approx. 2 miles south of study area. Other 2 occurrences approx. 7-9 miles west of study area (date unkn, prior 1961).
Hall's bush mallow <i>Malacothamnus hallii</i> [taxon not recognized in Jepson Manual]	—	—	1B.2	Chaparral and coastal sage scrub from 10 to 760 meters in elevation.	Could occur ; suitable sage scrub habitat present; however, no plants were found during detailed botanical surveys. Closest occurrence in 9-quad search is approx. 7 miles southwest of study area (obsvd 1976).
Mt. Diablo cottonweed <i>Atriplex amphibolus</i>			3.2	Broadleafed upland forest, chaparral, cismontane woodland, valley and foothill grassland with rocky soil from elevation 45 - 825 meters	Could occur ; suitable habitat present; however, no plants were found during detailed botanical surveys.

Special-Status Plant Species Known or Potentially Occurring in the Calaveras Dam Replacement Study Area (Continued)

Species	Status ¹			Habitat	Potential for Occurrence
	USFWS	CDFG	CNPS		
San Antonio Hills monardella <i>Monardella antonia</i> ssp. <i>antonia</i>			3	Chaparral and cismontane woodland from elevation 500 - 1000 meters	Could occur; suitable habitat present; however, no plants were found during detailed botanical surveys.
Robust monardella <i>Monardella villosa</i> ssp. <i>globosa</i>	—	—	1B.2	Openings in broadleaved upland forest, chaparral, cismontane woodland, valley and foothill grassland, from 30-300 meters.	Could occur; suitable woodland, forest, and grassland habitat in study area; however, no plants were found during detailed botanical surveys. No occurrences in 9-quad search. Closest occurrence is approx. 15 miles north of study area (obsvd 1999).
Prostrate navarretia <i>Navarretia prostrata</i>	—	—	1B.1	Mesic sites in coastal scrub, alkaline valley and foothill grassland, and vernal pools from 15 to 700 meters in elevation.	Could occur; marginal suitable habitat present in study area; however, no plants were found during detailed botanical surveys. Closest occurrence in 9-quad search is approx. 6 miles west of study area (obsvd 2001).
Mt. Diablo phacelia <i>Phacelia phacelioides</i>	—	—	1B.2	Rocky sites in chaparral and cismontane woodland from 500 to 1,370 meters in elevation.	Could occur; suitable woodland habitats present; however, study area is lower than species' known elevation range. No plants were found during detailed botanical surveys. Only occurrence in 9-quad search is historic (obsvd 1941) approx. 11 miles southeast of study area.
Hairless popcorn-flower <i>Plagiobothrys glaber</i>	—	—	1A	Alkaline meadows and seeps and coastal salt marshes and swamps from 15 to 180 meters in elevation.	Not expected to occur; no suitable alkaline or salt marsh habitat present in study area, and no plants were found during detailed botanical surveys. <i>Plagiobothrys glaber</i> is presumed extinct in California. Closest occurrence is historic (1955) and may be misidentified. It is approx. 7 miles southwest of study area.

Special-Status Plant Species Known or Potentially Occurring in the Calaveras Dam Replacement Study Area (Continued)

Species	Status ¹			Habitat	Potential for Occurrence
	USFS	CDFG	CNPS		
Oregon polemonium <i>Polemonium carneum</i>			2.2	Coastal prairie, coastal scrub, and lower montane coniferous forest from elevation 0 - 1830 meters	Could occur; suitable habitat present; however, no plants were found during detailed botanical surveys. Closest occurrence in CNDDb is approx. 10 miles northwest of study area (obsvd 1932).
Rock sanicle <i>Sanicula saxatilis</i>	—	R	1B.2	Rocky sites in broadleaved upland forest, chaparral, and valley and foothill grassland from 620 to 1,175 meters in elevation.	Could occur; suitable forest, chaparral and grassland habitat present; however, study area is lower than species' known elevation range. No plants were found during detailed botanical surveys. Closest occurrence in 9-quadrant search is approx. 11 miles southeast of study area (obsvd 1986).
Rayless ragwort <i>Senecio aphanactis</i>	—	—	2.2	Alkaline flats in chaparral, cismontane woodland, coastal scrub from 15 to 800 meters in elevation.	Not expected to occur; no suitable alkaline flat habitat present in study area, and no plants were found during detailed botanical surveys. No occurrences in 9-quadrant search. Two closest occurrences are historic (1888, 1933) and are approx. 25-28 miles north of study area.
Maple-leaved checkerbloom <i>Sidalcea malachroides</i>	—	—	4.2	Broadleaved upland forest, coastal scrub, and North Coast coniferous forest, often in disturbed areas, from 2 to 700 meters in elevation.	Could occur; suitable forest and scrub habitat present in study area; however, no plants were found during detailed botanical surveys. Only occurrence in 9-quadrant search is historic (obsvd 1896) and is approx. 2 miles south of study area.
Metcalf Canyon jewel-flower <i>Streptanthus albidus</i> ssp. <i>Albidus</i>	E	—	1B.1	Serpentine soils in valley and foothill grassland from 45 to 800 meters in elevation.	Could occur; suitable serpentine habitat present in study area; however, no plants were found during detailed botanical surveys. Closest occurrences in 9-quadrant search approx. 10 miles south of study area (obsvd 2001).
Most beautiful jewel-flower <i>Streptanthus albidus</i> ssp. <i>peramoenus</i>	—	—	1B.2	Serpentine soils in chaparral, cismontane woodland, and valley and foothill grassland from 120 to 1,000 meters in elevation.	Known to occur; several small occurrences of <i>Streptanthus albidus</i> ssp. <i>peramoenus</i> were found in the study area. Closest reported occurrence is the same occurrence observed within the study area (obsvd 2003).

Special-Status Plant Species Known or Potentially Occurring in the Calaveras Dam Replacement Study Area (Continued)

Species	Status ¹			Habitat	Potential for Occurrence
	USFWS	CDFG	CNPS		
California seablite <i>Suaeda californica</i>	E		1B.1	Marshes and swamps in margins of coastal salt marshes, elevation 0-5 meters.	Not expected to occur; no suitable marsh or swamp habitat at 0-5 meters elevation in study area. No plants were found during detailed botanical surveys. Only occurrence in 9-quadrant search is approx. 6 miles west of study area (observed 1986).
<i>Notes:</i> ¹Legal Status Definitions: <u>U.S. Fish and Wildlife Service (USFWS)</u> E Endangered T Threatened <u>California Department of Fish and Game (CDFG)</u> E Endangered T Threatened R Rare SC Species of Special Concern <u>California Native Plant Society (CNPS) Categories</u> 1A Plants presumed extinct in California 1B Plant species considered rare, threatened, or endangered in California and elsewhere 2 Plant species considered rare, threatened, or endangered in California but more common elsewhere					

Sources: May and Associates 2006b, CNPS 2009, CNDDB 2009.

Special-Status Wildlife Species Known or with Potential to Occur in the Calaveras Dam Replacement Study Area

Species	Status ¹		Habitat	Potential for Occurrence
	USFWS	CDFG		
Invertebrates				
Conservancy Fairy Shrimp <i>Branchinecta conservatio</i>	E		Vernal pools and swales	Not expected to occur ; no suitable habitat known in the Alameda Watershed (Jones and Stokes 2006) and none within the study area (May and Associates 2006a).
Vernal Pool Fairy Shrimp <i>Branchinecta lynchi</i>	T		Vernal pools and seasonal wetlands	Not expected to occur ; no suitable habitat known in the Alameda Watershed (Jones and Stokes 2006) and none within the study area (May and Associates 2006a).
Vernal pool tadpole shrimp <i>Lepidurus packardii</i>	E	—	Vernal pools in valley and foothill grasslands.	Not expected to occur ; no suitable habitat known in the Alameda Watershed (Jones and Stokes 2006) and none within the study area (May and Associates 2006a).
Bay checkerspot butterfly <i>Euphydryas editha editha</i>	T	—	Serpentine soils where primary (native plantain) and secondary (owl's clover) larval food, and adult nectar sources are present.	Not expected to occur ; not observed during focused surveys conducted at Calaveras Reservoir in 2004 and 2005; primary larval food plants present in small fragmented stands and not usually in association with secondary larval food sources or adult food sources; no known populations within dispersal range to colonize the study area (ECS 2004a, 2005).
Callippe silverspot butterfly <i>Speyeria callippe callippe</i>	E	—	Grasslands containing larval food (johnny jump-up) and adult food (e.g., California buckeye) sources.	Could occur ; adult <i>Speyeria callippe</i> were detected during focused surveys; subspecies best described as “near” <i>S.c. callippe</i> ; habitat is present in the study area (ECS 2004a).
Foothill yellow-legged frog <i>Rana boylei</i>	—	SC	Shallow, flowing streams with some cobble-sized substrate.	Known to occur ; documented breeding within the study area in Arroyo Hondo (SFPUC unpublished data 2002, EDAW unpublished data) and Alameda Creek (CNDDB 2006a).

Special-Status Wildlife Species Known or with Potential to Occur in the Calaveras Dam Replacement Study Area (Continued)

Species	Status ¹		Habitat	Potential for Occurrence
	USFWS	CDFG		
Western spadefoot toad <i>Spea hammondi</i>	—	SC	Vernal pools and other seasonal ponds in valley and foothill grasslands.	Not expected to occur ; no habitat known in the Alameda Watershed (Jones and Stokes 2004); no vernal pool habitat identified within the study area (May and Associates 2006a); nearest known occurrences are near Lawrence Livermore Lab and Coral Hollow, Alameda County (CNDDDB 2006a).
Western pond turtle <i>Actinemys (=Clemmys) marmorata</i>	—	SC	Freshwater marsh, ponds, lakes, rivers, vernal pools; require emergent rocks or wood for basking and adjacent open grasslands for nesting.	Known to occur ; documented in Arroyo Hondo (SFPUC unpublished data 2003-2005), Calaveras Reservoir and a pond within the study area (EDAW unpublished data) and in Alameda Creek (CNDDDB 2006a).
Silvery legless lizard <i>Anniella pulchra pulchra</i>	—	SC	Areas with sandy or loose, loamy soils under sparse vegetation in chaparral or woodlands, including sycamores, oaks or cottonwoods on stream terraces where soils retain adequate moisture.	Could occur ; suitable habitat is present in the Alameda Watershed study area (Jones and Stokes 2006), including the study area.
California horned lizard <i>Phrynosoma coronatum frontale</i>	—	SC	Variety of upland habitats that have low-bushes for cover, openings for sunning, and loose soil for burrows.	Could occur ; suitable habitat is present in the Alameda Watershed study area (Jones and Stokes 2006), including the study area.
Alameda whipsnake <i>Masticophis lateralis euryxanthus</i>	T	T	Coastal scrub and chaparral, and adjacent grasslands and woodlands, especially in association with rocky outcrops.	Could occur ; documented adjacent to the study area on EBRPD land (EBRPD unpublished data 2006); suitable habitat is present in the study area and is presumed occupied by USFWS (USFWS 2006a).
Birds				
White-tailed kite <i>Elanus leucurus</i>	—	FP	Forages in open meadows, grasslands, and agricultural fields; nests in moderately tall trees (15 to 75 ft.).	Known to occur ; documented breeding in study area during spring 2006 surveys (EDAW unpublished data).

Special-Status Wildlife Species Known or with Potential to Occur in the Calaveras Dam Replacement Study Area (Continued)

Species	Status ¹		Habitat	Potential for Occurrence
	USFWS	CDFG		
Bald eagle <i>Haliaeetus leucocephalus</i>	D	E; FP	Forages in large bodies of water or rivers with adjacent snags or other perches; nests in large, tall trees near permanent water source.	Known to occur ; documented breeding in study area in 2006 (EDAW unpublished data). Two stick nests are located in adjacent oak trees on the west shore of the reservoir.
Northern harrier <i>Circus cyaneus</i>	—	SC	Forages in marshes, moist grasslands and meadows; nests on the ground in grassy or vegetated areas that are usually well concealed.	Could occur ; suitable habitat is present in the Alameda Watershed study area (Jones and Stokes 2006); including the study area.
Golden eagle <i>Aquila chrysaetos</i> (nesting and wintering)	—	FP	Forages in open grasslands and agricultural areas; nests in large trees, on shelves of cliffs or embankments.	Known to occur ; known in the Alameda Watershed study area (Jones and Stokes 2006); including the study area.
American peregrine falcon <i>Falco peregrinus anatum</i>	D	E; FP	Forages over a variety of habitats where aerial prey are present; nests on cliffs or ledges.	Could occur ; suitable habitat is present in the Alameda Watershed study area (Jones and Stokes 2006); including the study area in the vicinity of the dam.
California black rail <i>Laterallus jamaicensis coturniculus</i>		FP	Nests and forages in relatively large saline, freshwater, or brackish emergent marshes	Not expected to occur ; no suitable habitat in the study area.
Burrowing owl <i>Athene cunicularia</i>	—	SC	Open, dry grasslands and agricultural areas with available burrows.	Known to occur ; suitable habitat is present in the Alameda Watershed study area (Jones and Stokes 2004); including the study area; documented in study area in February 2006 (EDAW unpublished data).
Long-eared owl <i>Asio otus</i>	—	SC	Dense riparian and oak woodlands.	Could occur ; suitable habitat is present in the study area; species has not been detected in study area (Edwards 2006).

Special-Status Wildlife Species Known or with Potential to Occur in the Calaveras Dam Replacement Study Area (Continued)

Species	Status ¹		Habitat	Potential for Occurrence
	USFWS	CDFG		
Short-eared owl <i>Asio flammeus</i>	—	SC	Tall (ungrazed) grasslands and marshes with dense vegetation.	Not expected to occur ; no breeding habitat known in the Alameda Watershed (Jones and Stokes 2006). Species is rare in Santa Clara County (Bousman 2005) and has not been detected in study area (Edwards 2006).
Loggerhead shrike <i>Lanius ludovicianus</i>	—	SC	Grasslands, open woodlands and agricultural areas with scattered shrubs.	Known to occur ; suitable habitat is present in the Alameda Watershed study area (Jones and Stokes 2006), including the study area; present in study area during spring 2006 surveys (EDAW unpublished data).
Least Bell's Vireo <i>Vireo bellii pusillus</i>	E	E	Riparian woodland with well-developed overstories and understories.	Not expected to occur ; very rare in Alameda and Contra Costa Counties (Jones and Stokes 2006).
Grasshopper sparrow <i>Ammodramus savannarum</i>		SC	Nests and forages in dense grasslands; favors a mix of native grasses, forbs, and scattered shrubs	Could occur ; suitable habitat is present in the study area; documented in study area during spring 2006 surveys (EDAW unpublished data).
Tricolored blackbird <i>Agelaius tricolor</i>	—	SC	Protected nesting substrate (e.g., dense freshwater marsh or riparian vegetation including either flooded, thorny, or spiny vegetation; upland grasslands with dense thistles) with access to insect prey.	Could occur ; bred in Sunol Valley in 1971, was re-recorded in April 1994 (CNDDDB 2006a); grassland habitat is present in the study area; not documented in study area during breeding season (EDAW unpublished data).
Mammals				
Townsend's big-eared bat <i>Corynorhinus townsendii townsendii</i> (roosting)	—	SC	Caves, mines and cavernous building spaces (e.g., large attics) in mesic habitats.	Known to occur ; suitable habitat is present in the Alameda Watershed study area (Jones and Stokes 2004); one individual documented in a mine tunnel at Calaveras Dam in 1997 (CNDDDB 2006a).

Special-Status Wildlife Species Known or with Potential to Occur in the Calaveras Dam Replacement Study Area (Continued)

Species	Status ¹		Habitat	Potential for Occurrence
	USFWS	CDFG		
Pallid bat <i>Antrozous pallidus</i> (roosting)	—	SC	Crevices in rocks, caves, mine, trees hollows, buildings, bridges, often in trees in oak woodlands.	Could occur ; known in the Alameda Watershed study area (Jones and Stokes 2006); including the study area.
Western mastiff bat <i>Eumops perotis californicus</i> (roosting)	—	SC	Crevices on cliffs faces, boulders and buildings, usually with space for at least a 10-foot a vertical drop.	Could occur ; known in the Alameda Watershed study area (Jones and Stokes 2006); including the study area.
Berkeley kangaroo rat <i>Dipodomys heermanni berkeleyensis</i>	—	² —	Grasslands and openings in chaparral and foothill woodlands.	Could occur ; known from historical collections, recent Heermann's kangaroo rat captures on EBRPD land are considered this subspecies, based on range.
San Francisco dusky-footed woodrat <i>Neotoma fuscipes annectens</i>	—	SC	Forested, chaparral, and riparian habitats.	Not expected to occur ; not likely to occur in the Alameda Watershed (Jones and Stokes 2006).
San Joaquin kit fox <i>Vulpes macrotis mulica</i>	E	T	Grasslands and open scrub with loose-textured soils for burrowing; typically in level ground.	Not expected to occur ; Alameda Watershed is outside the known range of this species (Jones and Stokes 2006).
American badger <i>Taxidea taxus</i>	—	SC	Drier open grassland, shrub, and forest habitats with friable soils.	Could occur ; known in the Alameda Watershed study area (Jones and Stokes 2006); suitable habitat is present in the study area.
<i>Notes:</i> ¹ Legal Status Definitions: U.S. Fish and Wildlife Service (USFWS) E Endangered T Threatened SC Species of Special Concern D Delisted FP Fully Protected No legal status, but considered rare under CEQA Guidelines Section 15380. <i>Sources:</i> CDFG 2009, CNDDDB 2009, Hickman 1993, USFWS 2009.				

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PERSONAL COMMUNICATIONS

Bousman, Bill. Local Expert Ornithologist. Email to Thomas Leeman of EDAW regarding historical records of bald eagles and osprey on Calaveras Reservoir, July 31, 2006.

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Appendix C.2

Evaluation of Proposed Mitigation Areas for the Calaveras Dam Replacement Project

Memorandum

Date: June 22, 2009
To: 03010123.18 Calaveras Dam Replacement Project File
From: Thomas Leeman, EDAW Wildlife Biologist
Subject: Evaluation of Proposed Mitigation Areas for the Calaveras Dam Replacement Project

Distribution:

Purpose

The Calaveras Dam Replacement Project (CDRP) Draft Environmental Impact Report (DEIR) recommends compensatory mitigation for impacts to sensitive natural communities and special status species. Compensatory mitigation is necessary to comply with CEQA and reduce project impact to the following sensitive biological resources:

- 4.61 acres of wetlands and open water, and 4,682 linear feet of stream habitat;
- 7.9 acres of riparian habitat;
- 24.0 acres of oak woodland and savannah;
- 0.11 acres and 945 linear feet of California red-legged frog aquatic breeding habitat, 2.14 acres and 3,935 linear feet of aquatic non-breeding habitat, and 590 acres of upland habitat;
- 0.11 acres of California tiger salamander aquatic and 471 acres of upland habitat;
- 30 acres of scrub habitat and 13.4 acres of rock outcrop habitat for the Alameda whipsnake, and 574 acres of woodland and grassland habitat;
- 0.57 acres of callippe silverspot butterfly larval habitat;
- 186 acres of annual grassland habitat; and

- 13.6 acres of serpentine grassland habitat.

EDAW and the San Francisco Public Utilities Commission's (SFPUC) Habitat Reserve Program evaluated resources within proposed mitigation areas through an iterative process and selected four areas for compensating impacts: the South Calaveras, San Antonio, Sage Canyon, and Goat Rock mitigation areas (Figure 1). This memo provides documentation that the four areas proposed for compensatory mitigation are available and suitable to satisfy CEQA requirements.

Methods

Conditions at the selected mitigation areas were assessed based on current and historical aerial photography, existing data, field investigations, reconnaissance surveys, and discussions with knowledgeable agency staff. Site assessments considered jurisdictional waters, hydrology, soils, vegetation, and special-status species. EDAW used a Geographic Information System (GIS) to identify and quantify acres of habitat by vegetation communities present in each mitigation area using vegetation mapping completed for the Alameda Watershed Habitat Conservation Plan (AWHCP). Stream lengths were measured using hydrology information from the California Spatial Information Library (CaSIL).

EDAW biologists Thomas Leeman, Gerrit Platenkamp, Angie Harbin-Ireland and Veronica Wunderlich conducted habitat evaluations at the mitigation areas. This investigation focused on evaluating the quality and suitability of habitats for each mitigation area to support the target habitats and wildlife species. Wetlands and creeks were evaluated for the potential to restore or expand wetland and creek habitat, and aquatic habitats were also qualitatively assessed for their potential to support the various life history stages of aquatic species. Ponds were examined from the shoreline for presence of amphibian or fish species. Rock outcroppings were evaluated for their potential to support bats and reptiles. Understory vegetation and open areas were surveyed for evidence of mammal activity and ground squirrel (*Spermophilus beecheyi*) burrow concentrations were documented. Vegetation communities were located and ground-truthed for habitat quality utilizing aerial photos. Typical views in each mitigation area were photographed (Attachment A).

Results and Findings

The selected mitigation areas are located entirely on SFPUC-owned land and are not open to the public. Photos of the four mitigation areas are provided as an attachment to this memo. Field survey findings are described below by mitigation area.

South Calaveras Mitigation Area

The South Calaveras Mitigation Area (Figure 2) is a 641-acre area south of Calaveras Reservoir. Currently, the area is a mosaic of oak woodlands, grasslands, and riparian habitats. Vegetation is composed of nonnative grassland (504 acres), mixed evergreen/oak woodland (101 acres), coyote brush scrub (6 acres), Diablan sage scrub (6 acres), sycamore alluvial woodland (5 acres), valley oak woodland (4 acres), willow riparian forest (4 acres), and seep wetland (2 acres). There are four stock ponds, totaling about 5 acres, and a small portion is developed (3 acres). Ephemeral drainages and intermittent streams, including Calaveras Creek,

collect and convey water through the mitigation area, draining to either Calaveras Reservoir or to the four stock ponds.

Aerial photography from 1940 shows that the area south of Calaveras Reservoir, including the South Calaveras Mitigation Area, has historically been farmed intensively, with most of the area used as hay fields. From 1948 to 1993, the area along Calaveras Creek upstream of the reservoir was used as an industrial site, known as the Calaveras Test Site, where explosives were tested. The site contains several structures, a septic tank, an underground water tank, and an underground diesel storage tank.

Calaveras Creek is degraded by historic channelization and crossing structures, and there is strong potential to remedy historic alterations and restore and expand riparian vegetation along the creek. Several ephemeral channels are deeply incised, with active head cuts that could be stabilized. With some excavation and other modifications, seasonal wetlands could also be established or expanded in and adjacent to Calaveras Creek, and south of the western-most stock pond ("Goldfish Pond," Photo 1).

All four ponds in the South Calaveras Mitigation Area have been documented as containing bullfrogs and nonnative predatory fish (e.g., bass, shiner, and mosquitofish). Three of the ponds were seined in 1994 (LSA 1994); no fish were detected, and bullfrogs were present only in Stock Pond. Twelve years later, EDAW found robust bullfrog populations at all four ponds, and by 2008, predatory fish had been documented in all four of the ponds. Thus, while these four ponds provide excellent habitat and opportunity as mitigation sites, they are impaired by the presence of predators. Most drainages in the mitigation area are deeply incised and densely vegetated (Photos 2 and 3). Thus they are not likely utilized by California tiger salamander; however, they provide suitable non-breeding aquatic habitat for California red-legged frog.

Over 5.3 acres of callippe silverspot butterfly larval habitat (i.e., grassland with the larval host plant *Viola pedunculata*) was mapped in nonnative grasslands located east of Marsh Road and north of Calaveras Creek. Although current grazing practices do not appear to adversely affect the silverspot or its larval food plant, weedy invasive plants and annual grasses are prevalent in some portions of the grasslands at the South Calaveras Mitigation Area and could spread within the grassland larval habitat. The larval habitat could be managed to improve conditions and reduce the potential for degradation from invasive plants.

A large continuous scrub patch (Photo 4) is located in the central portion of the area on a northeast facing slope. This area, as well as the smaller scrub patches along the ridges which intergrade with woodlands and grasslands, provide habitat for Alameda whipsnake. As shown in the attached photos scrub varies from dense to open. Rock outcrops are not present, however abundant ground squirrel burrows were present providing refugia and hibernation opportunities for snakes and amphibians. The extensive trees and shrubs on site provide valuable nesting habitat for birds and roost sites for bats.

The South Calaveras Mitigation Area provides opportunities to improve and expand over 11 acres of wetlands and about 10 acres of riparian woodland and scrub habitat. Over 5 acres of California red-legged frog and California tiger salamander breeding habitat, and over 5 acres of callippe silverspot larval habitat could also be improved. The mitigation area also provides the opportunity to preserve over 4 acres seeps and over 7,000 linear feet of streams that represent

California red-legged frog aquatic non-breeding habitat, as well as over 630 acres of upland habitat for California red-legged frog and California tiger salamander and over 620 acres of non-scrub habitat for Alameda whipsnake.

San Antonio Mitigation Area

The San Antonio Mitigation Area (Figure 2) is a 254-acre area on the northeast shore of San Antonio Reservoir. This area is entirely within the Alameda Creek watershed. Vegetation includes nonnative grassland (151 acres), mixed evergreen/oak woodland (2 acres), valley oak woodland (6 acres), Central Coast live oak riparian forest (4 acres), white alder riparian forest (29 acres), willow riparian forest (22 acres), oak savannah (31 acres), Diablan sage scrub (5 acres), and fresh water marsh (4 acres). The San Antonio Mitigation Area straddles approximately 10,000 linear feet of San Antonio Creek immediately upstream of the reservoir. The western portion of the mitigation area also encompasses the downstream stretch of Indian Creek, approximately 2,400 linear feet upstream of the reservoir.

Historic aerial photography and field observations indicate that the mile of San Antonio Creek immediately upstream of San Antonio Reservoir could support additional sycamore alluvial woodland and riparian oak. While most of the riparian corridor is characterized by an open canopy of oaks and sycamores, very dense riparian forest is present at the mouth of Indian Creek which included stands of coyote brush (*Baccharis pilularis*) (Photos 5 and 6).

The San Antonio Creek channel is characterized by variously sized cobbles, periodic side pools, vertical banks in some places incised 2–5 feet, and filamentous algal growth on rocks. The channel is fringed by mulefat (*Baccharis salicifolia*) which is 3–7 feet tall and dense in some places. Small mule fat recruits are present within the channel, however they showed evidence of having been grazed and emergent marsh vegetation is lacking. Several off channel pools were located along San Antonio Creek that provide calmer waters for potential amphibian breeding. Tree frog (*Hyla regilla*) egg masses were observed in the one of the larger pools on the easternmost portion of the area (Photos 7 and 8). Some of these ponds are characterized by undercut banks and exposed tree roots as well as mulefat and grassy vegetation that provides habitat structure, although emergent marsh vegetation was generally lacking and the water depth was typically a few inches to a foot. Downed tree branches within the open riparian woodlands provide refugia for reptiles, amphibians, and birds. Many of these trees are large with snags and cavities that provide valuable nesting and roosting habitat for birds.

Nonnative annual grassland typical of the region dominates the vegetation in this mitigation area. Historic and contemporary aerial photography shows much of the grassland area to have supported oak savannah, and oak savannah is still present in grasslands adjacent to the mitigation area. Several large ground squirrel colonies were mapped in the western grasslands. Grassland vegetation is short (2–6 inches) and is grazed. The land within the mitigation area south of San Antonio Creek gradually slopes up from the floodplain of the creek (Photo 9); the rise from the floodplain to the north of the creek is an abrupt vertical bank 60–70 feet high (Photo 10). In many places it is characterized by exposed rock or patchy scrub vegetation, particularly in the eastern extent of the mitigation area. Several ephemeral channels drain north into the main creek channel.

Scrub present along the north bank of San Antonio Creek is suitable for Alameda whipsnake although it is patchy and generally consists of a narrow band of scrub up to approximately 100 feet wide and is flanked by grasslands and riparian habitat. A large area of contiguous scrub habitat is located southeast of the mitigation area that provides cover, foraging, and movement opportunities for Alameda whipsnake. Abundant ground squirrel burrows and downed tree branches within grasslands and the open riparian woodlands provide potential upland refuges for special-status reptile and amphibian species including California red-legged frog, California tiger salamander, and Alameda whipsnake. Grasslands also provide suitable dispersal habitat for these species between potential refuge sites and the numerous aquatic features in the vicinity.

California red-legged frog has been documented as present (but not confirmed breeding) in Indian Creek and San Antonio Creek. Both creeks are characterized by ample vegetative cover and channel complexity making them highly suitable for shelter, foraging, predator avoidance, and aquatic dispersal for juvenile and adult California red-legged frogs. However, based on the shallow depth of the creek they are not expected to provide suitable breeding habitat within the mitigation area.

The San Antonio Mitigation Area provides opportunities to improve and expand about 30 acres of riparian woodland and scrub habitat, over 25 acres of upland oak woodlands, and about 70 acres of oak savannah. The mitigation area also provides the opportunity to preserve over 4 acres and over 10,000 linear feet of streams of California red-legged frog aquatic non-breeding habitat, as well as about 220 acres of upland habitat for California red-legged frog and California tiger salamander, and over 25 acres of scrub and 190 acres of non-scrub habitat for Alameda whipsnake.

Sage Canyon Mitigation Area

The Sage Canyon Mitigation Area (Figure 2) is a 584-acre area north of the Arroyo Hondo arm of Calaveras Reservoir. It extends up steep slopes from the reservoir edge to the top of Oak Ridge. A large (186-acre) stand of Diablan sage scrub extends up Arroyo Hondo from the eastern part of the mitigation area. Vegetation in the mitigation area includes nonnative grassland (298 acres), mixed evergreen/oak woodland (130 acres), Diablan sage scrub (99 acres), oak savannah (59 acres), and rock outcrop (7 acres). A small (about ¼ acre) stockpond is located in the northeast portion of the mitigation area. Additional Diablan sage scrub (about 4.8 acres) is located within ½ mile to the northwest of the mitigation area. Cattle have access to the mitigation area, although steep slopes reduce their use of the eastern portion of the area.

The stock pond (Photo 11) appears quite deep and emergent vegetation is absent. Western toads were observed in the pond. Several dead catfish were observed at the pond in March 2009. As the area slopes toward the reservoir the landscape is dominated by intergrading scrub and oak woodland that includes poison oak (*Toxicodendron diversilobum*), coyote brush, coast live oak (*Quercus agrifolia*), and buckeye (*Aesculus californica*), among other shrub and tree species typical of the region. Scrub habitat varies from very dense to open and patchy. Steep topography (Photo 12) at the mitigation area limits the potential for water to pool, thus drainages in the mitigation area are not expected to provide breeding habitat for California red-legged frog. *Viola pedunculata* was observed blooming in grasslands in the northwest portion of the mitigation area, providing potential habitat for Callippe silverspot butterfly.

The numerous rock outcrops scattered throughout the mosaic of grasslands, oak woodland and large stands of scrub ranging from open to dense (Photo 13) make the area highly suitable for Alameda whipsnake. Rock outcrops provide retreat areas for small reptiles and numerous foraging opportunities for whipsnakes. Ground squirrel burrows provide retreat, breeding, and hibernation sites for whipsnakes.

Ground squirrel burrows on site also provide potential upland refuges for California red-legged frog and California tiger salamander, although the upper grassland dominated portion of the area is most suitable for tiger salamander dispersal and upland refuges. The area becomes steeper and more wooded closer to Calaveras Reservoir and is less suitable for the tiger salamander. California red-legged frog may utilize the area for dispersal, and steep drainages provide non-breeding aquatic habitat. The presence of predators in the pond diminishes its quality as breeding habitat for amphibians.

The Sage Canyon Mitigation Area provides opportunities to expand at least 40 acres and preserve about 100 acres of Diablan sage scrub habitat for Alameda whipsnake. Over 440 acres of Alameda whipsnake grassland and woodland habitat, and 7 acres of rock outcrops could be preserved. The mitigation area also provides the opportunity to improve and preserve about ¼ acre of California tiger salamander and California red-legged frog aquatic habitat and to preserve over 9,000 linear feet streams of California red-legged frog aquatic non-breeding habitat. Furthermore, over 590 acres of upland habitat for California red-legged frog and over 400 acres of upland habitat for California tiger salamander could be preserved in this mitigation area.

Goat Rock Mitigation Area

The Goat Rock Mitigation Area (Figure 2) is a 35-acre area that extends southward from the top of the ridge located to the north of Alameda Creek near the Alameda Creek Diversion Dam. Vegetation includes 35 acres of serpentine grasslands containing a fine-textured mosaic of rocky outcrops supporting a very high diversity of native species, including many restricted to these open habitats, such as dwarf plantain (*Plantago erecta*), bird's-eye gilia (*Gilia tricolor*), and goldfields (*Lasthenia californica*). Nearly 150 plant species were identified in a survey of 100-acres of grasslands that includes this mitigation area (ESA+Orion 2009, pp. 70-71). Cattle have access to the mitigation area and the level of livestock grazing during the dry winter of 2007-08 was similar to the rest of the Alameda Watershed in that the residual dry matter was low and areas where cattle congregate is heavily affected by treading (ESA+Orion 2009, p. 74). The soil at the mitigation area is mapped as Henneke rocky loam and Vallecitos rocky loam. Both soils contain fine textured, expansive soil horizons (U.S. Department of Agriculture Natural Resources Conservation Service 2008).

The area is characterized by grassy hillsides marked with numerous rock outcroppings and exposed serpentine soils (Photos 14 and 15). Ground squirrel activity and burrows are abundant although shrubs and trees are lacking with the exception of a few oaks located at the south eastern boundary. An east west drainage runs through the northern portion of the area. The drainage is characterized by grassy vegetation, *Juncus* spp., and a few inches of running water along most of its length.

Aquatic habitats on the Goat Rock Mitigation Area are restricted to a narrow drainage running through the area which provides a potential dispersal corridor for amphibians, although the lack of vegetation diminishes its value for cover and foraging. A stock pond located west of the area is suitable for California red-legged frog and California tiger salamander breeding based on the presence of adequate water depth, partial coverage by cattails (*Typha*), and the observation that it likely dries down in the summer eliminating predators that require permanent water sources (based on small size and gradually-sloping banks). The numerous ground squirrel burrows and rock outcrops within grasslands on the goat rock mitigation area provide upland refuge and dispersal habitat for California tiger salamander and California red-legged frog. Both species have been documented in the vicinity. Given the lack of trees and shrubs, nesting and roosting habitat for birds and bats is restricted to ground nesters and rock crevices. Large contiguous scrub patches are somewhat distant from the area, although it may be utilized by dispersing Alameda whipsnakes and burrows and rocks provide shelter and foraging opportunities.

The Goat Rock Mitigation Area provides opportunities to improve and preserve 35 acres of serpentine grasslands. The mitigation area also provides the opportunity to preserve 35 acres upland habitat for California red-legged frog and California tiger salamander, and of Alameda whipsnake non-scrub habitat, including rocky outcrops.

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Appendix D

Hydrology Modeling

Appendix D.1

Water System Modeling and Analysis Conducted for the CDRP Impact Assessment

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1. Introduction

This technical appendix summarizes the methodology and results of the hydrologic analyses conducted for the hydrology impact assessment for the Calaveras Dam Replacement Project (CDRP) Environmental Impact Report (EIR). This document includes descriptions of the analysis conducted by the CDRP EIR consultant team using output data derived from the San Francisco Public Utilities Commission's (SFPUC) water supply planning model, the Hetch Hetchy/Local Simulation Model (HH/LSM) and provided by the SFPUC. This type of analysis is also referred to as "post-processing" of data, since it involves analysis and manipulation of information following the completion of the model runs.

The analysis and methodology to a large degree mirrors the analysis performed for the Program EIR (PEIR). Applicable portions of the modeling performed for the PEIR were utilized for the CDRP EIR analysis. Modeling for the CDRP analysis could not be done independent of the system-wide modeling because the CDRP is part of that system. The HH/LSM analyzes system operations based on historical hydrology, including actual hydrological sequences and events, and the model allows the SFPUC to predict the consequences of changes to the system's facilities and/or operations. The SFPUC's model was used to predict potential impacts on hydrology in the Alameda watershed resulting from implementation of the proposed project. The HH/LSM is similar to the tools used by other water purveyors in the United States to plan system improvements.

A detailed description of the HH/LSM is provided in the *Water Supply System Modeling Report, Hetch Hetchy/Local Simulation Model* (SFPUC 2007) and is incorporated herein by this reference. This appendix, Appendix D.1, provides descriptions of the model runs and the methods used to post-process and analyze the HH/LSM data. Appendix D.2 – SFPUC Memorandum Detailing Revised 2018 HH/LSM Model Run Performed for the CDRP, prepared by the SFPUC, presents the model runs used for the analysis of the CDRP. Appendix D.3 describes the analysis performed to predict changes in lower Alameda Creek based on the HH/LSM modeling and USGS gage data. A full compilation of post-processed model data used for the CDRP is provided as an attachment to this document.

The post-processing effort included summarizing the myriad of data derived from the HH LSM modeling in a uniform, succinct format to allow for the analysis of potential hydrologic impacts of the proposed project compared to existing conditions. The CDRP EIR team utilized the post-processed results to identify potential direct impacts on hydrology (stream flow and reservoir water levels) in the affected watersheds as well as potential indirect impacts on related resources, including geomorphology, surface water quality, groundwater, fisheries, terrestrial biological resources, recreation, and visual resources.

This appendix is organized as follows:

1. **Modeling Scenarios** – An explanation of the model runs analyzed for the CDRP EIR. Further explanation of the model runs is provided in Appendix D.3.

2. **Hydrologic Modeling Methodology and Model Output Data** – A brief explanation of the HH/LSM, with reference to the SFPUC’s modeling documentation, *Water Supply System Modeling Report, Hetch Hetchy/Local Simulation Model* (SFPUC 2007), which provides greater detail on the operation of HH/LSM. Review of the data provided by the HH/LSM, with a focus on data used in the post-processing analysis.
3. **Post-processing Hydrological Analysis Methodology** – Discussion of the analyses performed on the HH/LSM data. Analyses included statistical summaries, calculation of reservoir levels, and hydrologic analyses to predict creek and river flows. Description of the quality control methodology implemented for the analysis of the model results.

2. Modeling Scenarios

The future, with project, model scenario analyzed in the CDRP EIR was the “Phased WSIP Variant, 2018”, the final program chosen for the PEIR with one change. The change involves facility modification and revised operation of the ACDD to allow for bypass flow in order to meet MOU flow requirements, with supplemental release from Calaveras Dam when insufficient flow exists in Alameda Creek to satisfy the requirements. The Phased WSIP Variant met MOU requirements with release only from Calaveras Dam. The existing condition model run assumptions did not change from the PEIR.

The model runs were initially developed as part of the PEIR through collaboration with the SFPUC, San Francisco Planning Department, Major Environmental Analysis (MEA) Division, and the PEIR consultants and were further revised with input from the CDRP EIR team. The SFPUC conducted the model run for the revised Phased WSIP Variant, referred to as the CDRP Variant, using the HH/LSM and provided the output data to the CDRP EIR team for post-processing analysis.

The model runs analyzed for the CDRP EIR are listed below. The code presented in brackets after each scenario name is the reference used by the SFPUC to denote the model run. Table 1, on p. D1-4, summarizes the major assumptions of the baseline and with project scenarios.

Baseline	Existing Conditions with “Calaveras Down” [VBA_BASERH]
Future Condition	Proposed Project (CDRP Variant) [WSIP 2018 CSRE ACDD RH DT2300]

2.1 Existing Conditions with “Calaveras Down” [VBA_BASERH]

The existing conditions or environmental setting, as defined under California Environmental Quality Act (CEQA) Section 15125, represents the physical environmental conditions as they exist at the time of the Notice of Preparation (NOP) and “will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant.”

Therefore, it follows that once the physical baseline conditions are established, impacts can be assessed by comparing changes that would result from implementation of the proposed project to the baseline condition. The NOP for the CDRP EIR as well as the WSIP PEIR was issued in

2005, and thus the year 2005 conditions generally represent existing (baseline) conditions for this analysis.

In most cases, the EIR description of the baseline reflects the regional system facilities and water supply operations in 2005. However, to be meaningful, the baseline must represent the expected variability of environmental conditions that could reasonably be expected in the future, based on the present and historical state of such conditions. In this EIR, because hydrology varies widely over time and cannot be properly represented at a specific point in time, the baseline for hydrology reflects a sufficiently long record to allow assessment of long-term variability. Therefore, the “existing conditions” in the PEIR are presented in terms of an 82-year depiction of hydrology (1920 to 2002) to provide a depiction of the range of environment conditions that occur within the varying hydrology of California. Current (2005) operating conditions are analyzed using HH/LSM by applying these 82-years of hydrology to determine how the current system would perform over a range of hydrologic conditions.

In addition to the baseline model runs, actual flow data, diversions, reservoir levels and releases were reviewed to aid in the determination of significance impacts.

As described above, the baseline condition used for the PEIR analysis to determine the significance of impacts is generally represented by the SFPUC facilities and system operating conditions in 2005 in all cases but hydrology. Thus, as described in Chapter 2 of the PEIR, the 2005 average annual customer purchase request is estimated at 265 million gallons per day (mgd), and system operations are restricted due to Division of Safety of Dams (DSOD) requirements that limit the storage capacity of Calaveras Reservoir. This baseline, also referred to as “Calaveras Down,” in the PEIR, does not represent the SFPUC’s historical operating conditions, since operation of Calaveras Reservoir at its full capacity has been a fundamental part of the regional water system prior to DSOD restrictions.

2.2 Proposed Project [WSIP_2018_CSRE_ACDD_RH_DT2300]

The SFPUC’s proposed project, referred to as the CDRP, is described in detail in Chapter 3 of the EIR. The CDRP involves replacement of the existing Calaveras Dam with a new dam to accommodate a public water supply reservoir with the same capacity as the pre-DSOD restricted reservoir. The existing dam was found to not meet current safety standards for large earthquakes, and operating levels in the reservoir have been substantially reduced since 2001 (approximately 38,100 AF) as a result of this finding. The new dam will be designed to meet current seismic safety design requirements, allowing for greater storage in the reservoir (up to 96,850 AF), similar to pre-DSOD restricted operating levels. The outlet works would be extended under the new dam, and new low-flow valves would be installed in addition to the relocated cone valve. A bypass tunnel is proposed in the Alameda Creek Diversion Dam to allow releases of water into Alameda Creek, when flows are available.

The CDRP is part of the SFPUC’s WSIP program. This is significant because the modeling performed for the project also includes assumptions for operation of the entire water system. The proposed program represents conditions in 2018, with 265 mgd average annual customer

purchase requests, the WSIP water supply sources in place, and all WSIP facility improvement projects constructed and in operation. It includes supplemental dry-year water sources and a maximum drought rationing policy of 20 percent.

Table 1 provides a summary of the model scenarios analyzed. Appendix O3 of the PEIR and D.2 of the CDRP EIR provide additional detail of the Phased WSIP Variant model run.

Table 1: Summary of Existing Conditions and Proposed Program

Program Element	Existing Condition, 2005, with Calaveras Down (CEQA Baseline) [VBA_BASERH]	Proposed Project and WSIP, 2018 Conditions [WSIP_2018_CSRE_ACDD_RH_DT2300]
Planning Year	2005	2018
Customer Purchase Request (annual average)	265 mgd	265 mgd + 10 mgd supplied from regional RW, Conservation & GW)
(Water Supply Sources (during nondrought and drought periods)	- Alameda watershed (with Calaveras Reservoir operating at reduced levels based on DSOD restrictions) - Peninsula watershed (with Lower Crystal Springs Reservoir operating at reduced levels based on DSOD restrictions) - Tuolumne River	- Alameda watershed (with Calaveras Reservoir restored to 31.5 BG) - Peninsula watershed (with Lower Crystal Springs Reservoir restored to max storage of 20.28 BG) - Tuolumne River, with no increased annual diversion over 2005 conditions - Recycled water/ groundwater/conservation in San Francisco and with Wholesale Customers, up to 20 mgd
Supplemental Dry-Year Water Supply Sources (for implementation during drought periods)	None	- Additional Tuolumne River diversions from TID and MID transfers of 2 mgd (average over design drought) - Westside Basin conjunctive use, 6 mgd (average over design drought)
Maximum Drought Rationing Policy	No defined limit but assumed incidental rationing of up to 25%	20%
System Firm Yield	219 mgd	245 mgd
WSIP Facility Improvement Projects	None	All 22 WSIP PEIR projects

DSOD = Division of Safety of Dams; TID = Turlock Irrigation District; MID = Modesto Irrigation District.

3. Water Supply Planning Model

3.1 Model Description

The data analysis for the CDRP was performed on output data from the SFPUC's HH/LSM. The following is a brief review of the HH/LSM. For a comprehensive discussion of HH/LSM design and operation, refer to *Water Supply System Modeling Report, Hetch Hetchy/Local Simulation Model* (SFPUC, 2007).

The HH/LSM is a computerized mathematical model used by the SFPUC to assist in the evaluation of its water system operations. The HH/LSM incorporates information about key aspects of the SFPUC regional water system, including facilities (i.e., reservoir and conveyance capacities) and operating procedures and “rules” that determine how and when water is moved through the system to the SFPUC’s customers. The operating procedures and rules include responses to seasonal variation in demand, allocation of demand to customer groups, and procedures to maximize the use of local watershed supplies, while “rules” include responses to regulatory requirements for instream flows and compliance with Raker Act obligations. Operation of the regional water system can be generally delineated between rules and strategies affecting the operation of the Bay Area water system, and rules and strategies affecting the operation of the Hetch Hetchy system.

The HH/LSM is personal-computer-based and was originally written in Fortran code, with spreadsheet input and output interfaces. The model has recently been updated to Visual Basic and now runs in a spreadsheet environment. The model can be modified to incorporate changes in operation assumptions or to allow the testing of possible modifications to the infrastructure and/or operation of San Francisco facilities, or other facilities affecting regional system operations (i.e., TID’s and MID’s operation of Don Pedro Reservoir). Certain hydrologic and hydraulic parameters are “input driven,” allowing the user to modify hydrology and the representation of physical characteristics such as reservoir capacity, preferred operational storage levels, water demands and certain operational decisions.

The model simulates system operations over the course of an 82-year sequential hydrologic period from July 1920 through September 2002. The model incorporates actual historical information about the hydrology (the amount of runoff as snowmelt and/or rainfall) that occurred in each year over the 82-year record for three distinct watersheds: the Tuolumne River, the Alameda Creek, and the Peninsula watersheds. This 82-year period includes many different types and sequences of actual hydrological events that occurred, ranging from flood events to droughts of different magnitude and duration. The long-term 82-year historical record is used in the model to represent the range of hydrologic conditions that could occur in the future and to assess how the system would perform in terms of an assumed system configuration and assumed operational objectives.

The model uses a watershed runoff forecasting routine (for snowmelt and rainfall) that projects the amount of runoff in the Tuolumne River basin, the Alameda Creek watershed and Peninsula watershed. The amount of expected runoff is then compared against the availability of reservoir storage to capture the runoff and the expected releases required from the reservoir to meet downstream requirements and diversions to San Francisco. If a reservoir is projected to spill, the model can simulate operational releases that would likely be made in those situations in order to enhance power generation from the system. This forecasting and decision process occurs continuously each month of the period being modeled.

The model simulates sequential hydrologic events on a monthly time step. That is, the model simulates the operation of facilities on a continuum, from one month to the next, one year to the next for 82 years. This method of modeling allows the investigation of sequential hydrologic

events varying in duration as well as varying in distribution of runoff. However, because the input and results are depicted as monthly volumes of water, a drawback of this monthly time-step approach is that the results may not adequately depict the day-to-day variations of operations, hydrology, or operational decisions that can occur in less than monthly intervals. In these instances, additional supplemental analysis is developed.

The HH/LSM is used iteratively; that is, the model input is adjusted following a review of the results from a model study. The model simulates system performance and operations for a recurrence of historical hydrologic events. Parameters reviewed are typically the simulated delivery of water to San Francisco customers and reservoir levels and releases. Model inputs that affect model decisions are adjusted until a simulation achieves an accepted, or desired, performance of the scenario being modeled. Results from the scenarios described above were compared to illustrate the effects of alternative system objectives and requirements, operational assumptions, and system configurations.

System operations during drought periods require more complex planning and system management than during nondrought years, and the SFPUC's drought planning uses as a backdrop the concept of a "design drought" and "system firm yield." System firm yield is a measure of the amount of water that can be delivered to customers without shortages during all anticipated hydrologic sequences. This yield is also comparable to the amount of delivery that would occur on average across the design drought period. The design drought is a planning tool developed by the SFPUC to anticipate and plan for drought. For planning purposes, the SFPUC uses a design drought that contemplates a more severe drought than historical events, and evaluates the system firm yield assuming the system is experiencing the design drought. This premise is founded on experience that illustrates that drought sequences can get more extreme as our hydrologic record lengthens. Studies suggest that there is a 30 percent chance that the SFPUC system will experience a drought in the next 75 years equal to or more severe than the 1987–1992 drought. The SFPUC uses a design drought based on the hydrology of the six years of the worst historical drought (1977–1992) plus the 2.5 years of the 1976–1977 drought, for a combined total of an 8.5-year design drought sequence.

For the purposes of the CDRP and the WSIP, the HH/LSM is the best available tool to predict potential impacts on water resources in the affected watersheds resulting from the proposed program. HH/LSM output was used to provide quantitative estimates of changes that would occur with implementation of the CDRP compared to the existing condition.

The HH/LSM is typical of water supply planning models utilized in California. With its diversity in weather—ranging from flood events to multi-year sequences of drought—California hydrology warrants the evaluation of water supply projects over a long sequence of years to measure system performance and reliability. The SFPUC, like other major California water purveyors, employs models to evaluate the effect of California hydrology on its ability to provide water supply (and to evaluate a system's effect on the environment). The East Bay Municipal Utility District and other municipal water purveyors use comparable models for the purpose of water supply planning. The California Department of Water Resources and U.S. Bureau of Reclamation use the CalSim II model, which employs the same approach as the HH/LSM to evaluate the statewide water supply.

Appropriately, the HH/LSM focuses narrowly on the SFPUC water system, but provides information that integrates into the overall California river system. In fact, the Department of Water Resources and Bureau of Reclamation use results from the HH/LSM in the evaluation of statewide water resources.

3.2 Model Limitations

The HH/LSM model is the best available tool for depicting the overall regional water system operations, and a number of limitations inherent in the model have been supplemented by additional data.

HH/LSM were used to estimate baseline and with-WSIP flows in Alameda Creek. However, the model results were not solely relied upon when evaluating flows in creeks immediately downstream of ACDD and Calaveras Reservoir that are normally minimal or affected by SFPUC operations for time periods less than a month in duration. This is because the model uses a monthly time interval. The model does not simulate day-to-day variations in water levels or releases to a stream, but instead provides an average water level and an average release in a given month. The inability of the model to illustrate short-term variations is generally not problematic when simulating continuous phenomena like storage or water level in a reservoir or flow in a perennial stream. The modeling limitation requires additional considerations such as operator experience when simulating intermittent phenomena such as infrequent spills or releases from reservoirs that may last only a few days as well as for ramping schedules and short duration peak flows in creeks. In additional instances such as the analysis of flow effects below Alameda Creek Diversion Dam, HH/LSM results have been refined or tiered from to provide additional insight to the effects of the WSIP upon stream flow for time periods less than a month in duration.

3.3 Model Output Data

The HH/LSM outputs data in a monthly time-step for each model simulation. Once the operation of the system is modeled under a particular set of assumptions, the model provides output information about how the system performs under that scenario in terms of water in reservoir storage, releases, water deliveries, and other parameters associated with the system's reservoirs, conveyance facilities, and treatment plants. The model provides information representing monthly volumes of water, although certain parameters have been converted to flow rates.

The SFPUC conducted the model runs analyzed in the CDRP EIR. Model runs were provided to the EIR team in spreadsheet format. Revision of the WSIP 2018 Variant model run occurred through an iterative process with the SFPUC and EIR consultant team in order to ensure that the CDRP project description was accurately represented in the CDRP Variant, particularly release of MOU flows from the ACDD and Calaveras Reservoir.

Table 2 lists key output information calculated by the model applicable to the Alameda Creek System. The model includes additional output for the Tuolumne and Peninsula Systems that have not been presented here. Highlighted rows denote data that were used in the post-processing analysis.

**Table 2: HH/LSM Output Parameters for Alameda Watershed
(Data Provided as Monthly Time Step for 82 Years of Historical Hydrology)**

Feature	Output Parameter
LOCAL SYSTEM (ALAMEDA CREEK WATERSHED)	
Calaveras	Calaveras Reservoir Storage Calaveras Reservoir Inflow from Arroyo Hondo Calaveras Reservoir Inflow from Upper Alameda Creek Calaveras Reservoir Release to San Antonio Reservoir Calaveras Reservoir Release to Sunol Valley WTP Calaveras Reservoir Release to Calaveras Creek Calaveras Reservoir Spill to Calaveras Creek Calaveras Reservoir Evaporation
San Antonio	San Antonio Reservoir Storage San Antonio Reservoir Inflow from San Antonio Creek San Antonio Reservoir Inflow from Calaveras Reservoir/SJPL San Antonio Reservoir Release to SVWTP San Antonio Reservoir Release to San Antonio Creek San Antonio Reservoir Spill to San Antonio Creek Total Stream Release from San Antonio Reservoir
Treatment Plant Delivery (MGD)	Calaveras Reservoir Flow to Sunol Valley WTP San Antonio Reservoir Flow to Sunol Valley WTP Sunol Valley WTP Production
Alameda Creek Flow Calculations	Total Inflow to ACDD Flow Passing ACDD Accretion to Confluence below ACDD/Calaveras Dam Flow at Alameda/Calaveras Confluence Accretion between Calaveras Confluence and San Antonio Confluence Alameda Creek Flow above San Antonio Confluence Flow below San Antonio Confluence
Alameda Creek Bypass and Recapture Flow Calculations	Total Inflow to ACDD Spill Past ACDD Bypass Requirement Limited to Available Divertable Flow to Calaveras Reservoir (Prior to Accounting for Instream Release) Bypass Flow for Requirement Unregulated Flow between ACDD and Calaveras Confluence Calaveras Release for MOU Total Release for MOU Available for Recapture Total Recaptured MOU Release

Notes:

MGD = million gallons per day; WTP = water treatment plant.

4. Hydrologic Computations and Data Presentation

4.1 Hydrologic Year Types

The HH/LSM produces a set of results for a hydrologic sequence of 82 years, 12 months each year. While at times it is necessary to evaluate the results from month to month and year to year, in many instances the illustration and understanding of results can be achieved by a grouping within water year types. Each year in the 82-year period of historical hydrology was ranked and grouped into hydrologic year types according to an appropriate wetness indicator. A grouping (referred to as an index) was developed for the local system (Alameda and Peninsula) reservoirs based on aggregated inflow to the reservoirs. This methodology was originally developed for the PEIR and was applicable to the CDRP analysis. The local system index was referred to as the Five Reservoir index and contains five hydrologic year-type categories:

Five Reservoir Index	Wet (W)
	Above Normal (AN)
	Normal (N)
	Below Normal (BN)
	Dry (D)

Hydrologic year types for the Alameda Creek and Peninsula watersheds are classified by a 20 percent grouping technique and are based on local stream gauge data and the SFPUC's estimation of flow into its five San Francisco Bay Area reservoirs (Calaveras, San Antonio, Crystal Springs, Pilarcitos, and San Andreas Reservoirs). Annual flow into each of the reservoirs was aggregated for each water year. The 20 percent of years when total runoff into the five reservoirs was lowest were designated dry years; the next driest 20 percent of years were designated below-normal years, and so on. Table 3 illustrates how these hydrologic year types apply over the historical record. Note that the table is organized according to rank.

4.2 Computations and Data Presentation

General Approach

The analysis of HH/LSM data focused on reservoir storage, releases, diversions, and deliveries. Data were analyzed according to the Alameda portion of the system, which corresponds to one of the three respective watersheds that would be affected by the proposed water supply and system operations changes. The following sections outline the general approach to the analysis of each system. Specific data sets were extracted from the model output and then ranked, statistically analyzed, summarized, and charted. The ultimate use of these data was to allow for comparison between the existing condition and the proposed project (and WSIP):

Comparisons were made by generating annual and monthly statistics for all years in the sequence as well as for each of the indexed year types (e.g., wet, above normal, etc.). The analysis performed can generally be divided into two primary hydrologic regimes: reservoir releases to rivers/creeks and reservoir storage.

Reservoir Releases/Spills to Rivers and Creeks

The HH/LSM predicts both reservoir releases and spills. Reservoir releases involve a release of impounded water through a reservoir's adit to the watercourse downstream of the dam. Releases are generally made to control water levels in the reservoir or to meet minimum flow requirements in the watercourse below the reservoir. Reservoir spills happen when impounded water discharges from a dam's spillway. Spills generally occur during periods of high flow when the reservoir is full. Reservoirs are usually operated to avoid spills by releasing water through the adits. For the purpose of this analysis, releases and spills were aggregated for each month of model output and reported as a release from each respective reservoir. Spills and releases were not considered separately, since both contribute to flow in the watercourse downstream of the reservoir.

Table 3: Comparison of Hydrologic Year Types for 5 Reservoir index

5 RESERVOIR INDEX		
Rank	Water Year	5RES Yr Type
1	1983	W
2	1998	W
3	1958	W
4	1941	W
5	1982	W
6	1995	W
7	1956	W
8	1952	W
9	1938	W
10	1997	W
11	1969	W
12	1973	W
13	1986	W
14	1980	W
15	1942	W
16	1967	W
17	1963	AN
18	1940	AN
19	1965	AN
20	1996	AN
21	1922	AN
22	1975	AN
23	1974	AN
24	1978	AN
25	1993	AN
26	1951	AN
27	1943	AN
28	1927	AN
29	1937	AN
30	2000	AN
31	1921	AN
32	1999	AN
33	1923	AN
34	1953	N
35	1928	N
36	1970	N
37	1984	N
38	1946	N
39	1926	N
40	1936	N
41	1945	N

42	1971	N
43	1935	N
44	1932	N
45	1979	N
46	1962	N
47	1949	N
48	1992	N
49	1981	N
50	2001	BN
51	1930	BN
52	1954	BN
53	1968	BN
54	1959	BN
55	1925	BN
56	1944	BN
57	2002	BN
58	1950	BN
59	1966	BN
60	1955	BN
61	1957	BN
62	1934	BN
63	1985	BN
64	1991	BN
65	1929	BN
66	1964	BN
67	1947	D
68	1994	D
69	1939	D
70	1948	D
71	1960	D
72	1972	D
73	1933	D
74	1961	D
75	1990	D
76	1987	D
77	1988	D
78	1989	D
79	1931	D
80	1976	D
81	1977	D
82	1924	D

Each comparison of reservoir releases to watercourses included a comparison of baseline data and with project data related to annual average releases, monthly average releases, and changes in monthly releases for all months and each year type over the 82 years of historical hydrology analyzed. The monthly value for a given year type was calculated as the average of all values for a given month within that year type. An example of a monthly comparison is provided in Table 4. Statistics were also generated for each monthly release including average, minimum, maximum, median and standard deviation. Comprehensive tables were also generated detailing the monthly release for all 82 years of hydrology for both the existing and with project future condition being analyzed as well as the changes to releases in any given month. This full data set essentially gave the reviewer access to the full model output in a compact format to aid in identifying trends or single-year anomalies and extremes in the data.

Monthly averages were charted, as were the 82 years of chronological releases, to visually detect trends and regularly occurring changes between the existing and with project condition being reviewed. Where relevant, additional charting was developed to highlight the percentage of monthly change for the 82-year hydrologic sequence, highlighting trends or single anomalies and extremes.

Reservoir Storage and Water Surface Elevation

Reservoir storage was presented on a monthly basis for each hydrologic year type and as an average for all years. This exercise was performed for all reservoirs in the SFPUC system as well as for Don Pedro Reservoir. Impoundments at the Alameda Creek Diversion Dam and Stone Dam do not have sufficient storage to warrant the exercise. Percent change between the existing condition and WSIP were also calculated and tabulated, including highlighting of months within year types with a change from the existing condition. An example of a monthly comparison for reservoir water surface elevation is provided in Table 5.

Reservoir water surface elevations were generated based on storage-elevation data provided by the SFPUC for each reservoir. Storage-elevation data did not generally include datum information, and several curves were incomplete. Datums were assumed to be U.S. Geological Survey (USGS) National Geodetic Vertical Datum 29; however, it is likely that some elevation data were provided on Crystal Springs Datum, which is 3.75 feet lower than the USGS datum. In the case of incomplete curve data, data extrapolations were performed to extend the curve over the full operating range of the reservoir, which was considered sufficient for the analysis being performed. Figure 1 presents an example of a storage-elevation curve used to generate reservoir elevation data.

Similar to the release data, monthly data were provided in tabular format for all months in the 82-year sequence to give the reviewer access to the full data set.

Table 4: Example of Reservoir Release Comparison
(Estimated average monthly flows from Calaveras Dam to Calaveras Creek under various conditions [cubic feet per second])

	Wet	Above Normal	Normal	Below Normal	Dry	All
Baseline Condition (2005), Calaveras Down						
Oct	0	0	0	0	0	0
Nov	0	0	0	0	0	0
Dec	28	3	4	0	0	7
Jan	151	45	6	0	0	40
Feb	297	106	16	0	0	83
Mar	162	50	6	0	0	43
Apr	84	8	0	0	0	18
May	0	0	0	0	0	0
June	0	0	0	0	0	0
July	0	0	0	0	0	0
Aug	0	0	0	0	0	0
Sept	0	0	0	0	0	0

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

Oct	7	7	7	7	7	7
Nov	3	3	4	4	5	4
Dec	15	1	2	2	2	4
Jan	81	9	3	3	8	20
Feb	259	54	3	4	12	66
Mar	159	43	2	4	10	43
Apr	84	8	0	1	4	19
May	0	1	2	3	5	2
June	3	4	5	6	6	5
July	6	7	7	7	7	7
Aug	7	7	7	7	7	7
Sept	7	7	7	7	7	7

Difference and Percent Change, Existing Condition (2005) vs WSIP (2030)

Oct	7	*	7	*	7	*	7	*
Nov	3	*	3	*	4	*	4	*
Dec	-13	[-46%]	-2	[-67%]	-2	[-50%]	-3	[-43%]
Jan	-70	[-46%]	-36	[-80%]	-3	[-50%]	-20	[-50%]
Feb	-38	[-13%]	-52	[-49%]	-13	[-81%]	-17	[-20%]
Mar	-3	[-2%]	-7	[-14%]	-4	[-67%]	0	[0%]
Apr	0	[0%]	0	[0%]	0	[0%]	1	[6%]
May	0	[0%]	1	*	2	*	2	*
June	3	*	4	*	5	*	5	*
July	6	*	7	*	7	*	7	*
Aug	7	*	7	*	7	*	7	*
Sept	7	*	7	*	7	*	7	*

Key

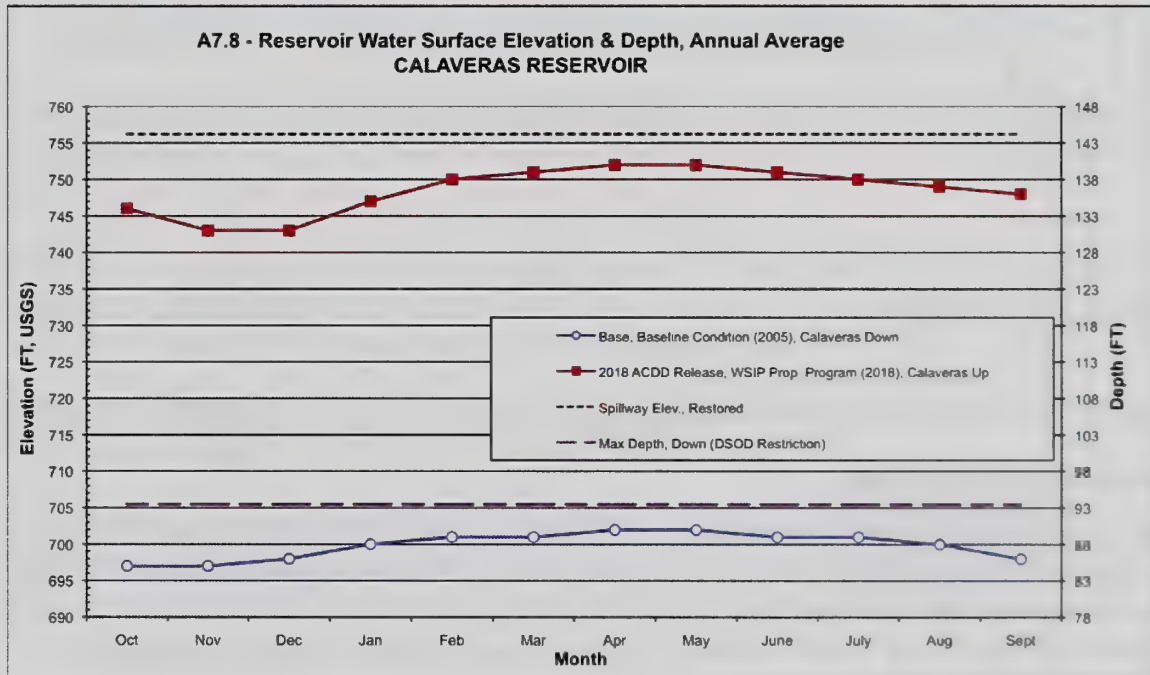
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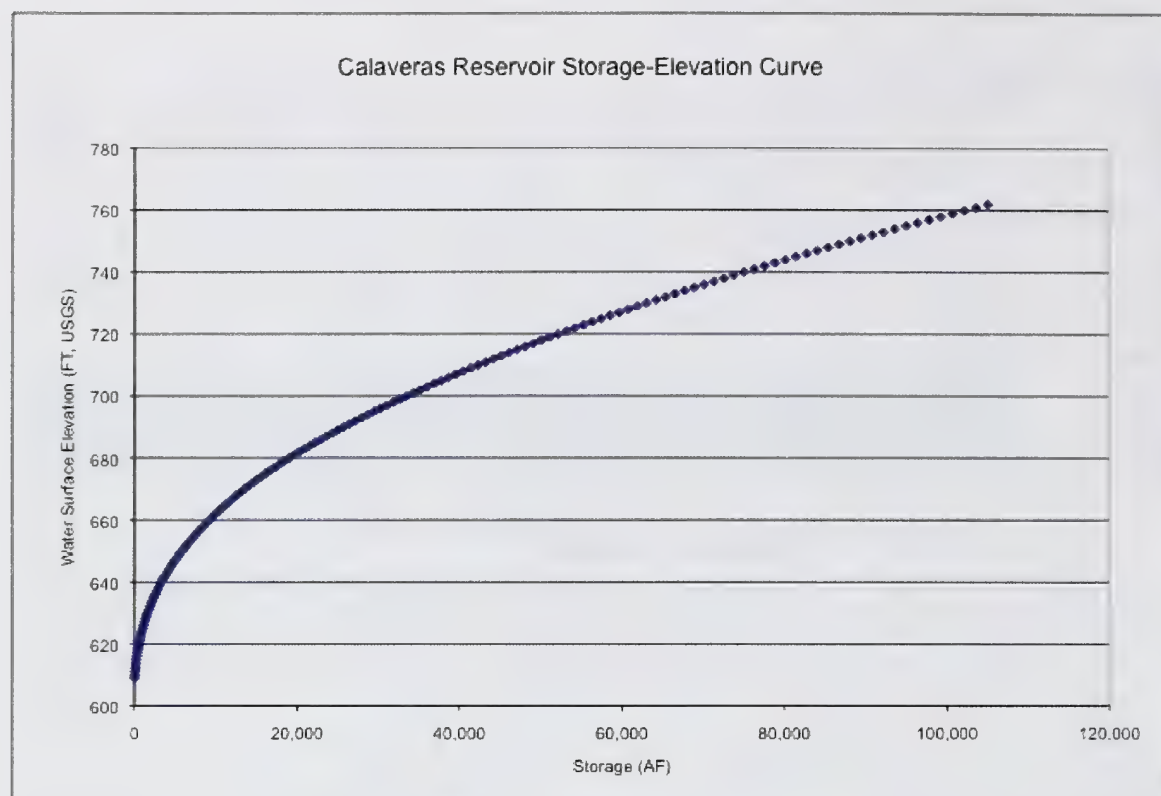
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Table 5: Example of Reservoir Surface Elevation Comparison

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Base, Baseline Condition (2005), Calaveras Down												
All	697	697	698	700	701	701	702	702	701	701	700	698
Wet	697	697	699	703	705	704	704	704	703	702	701	700
Above Normal	697	697	699	702	704	703	704	704	703	703	702	700
Normal	697	697	699	700	701	700	703	703	703	702	701	699
Below Normal	697	697	697	697	698	698	699	700	700	699	698	697
Dry	696	696	697	697	697	697	698	698	698	697	696	696
2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up												
All	746	743	743	747	750	751	752	752	751	750	749	748
Wet	748	745	746	753	755	756	756	756	755	754	753	752
Above Normal	747	743	744	750	755	755	756	756	755	754	753	752
Normal	745	742	743	746	750	753	754	754	753	752	752	751
Below Normal	746	742	742	744	747	750	750	750	749	749	748	747
Dry	745	742	741	742	742	742	743	742	742	741	740	739
Delta, Base vs 2018 ACDD Release												
All	49	46	45	47	49	50	50	50	50	49	49	50
Wet	51	48	47	50	50	52	52	52	52	52	52	52
Above Normal	50	46	45	48	51	52	52	52	52	51	51	52
Normal	48	45	44	46	49	53	51	51	50	50	51	52
Below Normal	49	45	45	47	49	52	51	50	50	50	50	50
Dry	49	46	44	45	45	45	45	44	44	44	44	43





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Figure 1: Example of a Storage Elevation Curve

Alameda Creek System

The Alameda Creek system encompasses SFPUC facilities in the Sunol Valley region. These include Calaveras Reservoir, Alameda Creek Diversion Dam, and San Antonio Reservoir. Local watercourses include Alameda Creek, Arroyo Hondo, Calaveras Creek, and San Antonio Creek. The following is a list of locations within the Alameda system analyzed using HH/LSM data.

Releases to Rivers/Creeks

1. Diversions from upper Alameda Creek to Calaveras Reservoir
2. Calaveras Reservoir releases to Calaveras Creek
3. San Antonio Reservoir releases to San Antonio Creek
4. Flow in Alameda Creek below the diversion dam (1)
5. Flow in Alameda Creek below the Calaveras Creek confluence (2)
6. Flow in Alameda Creek below the San Antonio Creek confluence (3)

Reservoir Storage

7. Calaveras Reservoir storage and water levels
8. San Antonio Reservoir storage and water levels

These analysis locations are shown in Figure 2, and the three flow locations in Alameda Creek (numbers shown in parenthesis after analysis locations 4, 5, and 6) are described in more detail below and in Figure 3.

Data for releases from Calaveras and San Antonio Reservoirs were obtained directly from the HH/LSM output data. Reservoir releases presented in this analysis include both spills and releases from the respective dam. The HH/LSM also provided output data on diversions from the Alameda Creek Diversion Dam to Calaveras Reservoir.

In addition to the releases and diversions, average monthly flow in Alameda Creek was estimated at three locations to aid in the impact analysis. Calculations were made for the following three locations:

1. Below the diversion dam
2. Below the Calaveras Creek confluence (below Calaveras Reservoir)
3. Below the San Antonio Creek confluence (below San Antonio Reservoir)

Figure 3 presents a flow schematic of the major components of the water balance on Alameda Creek. Evaporative and groundwater losses were not included in the balance, since these losses are not expected to vary substantially among the scenarios.

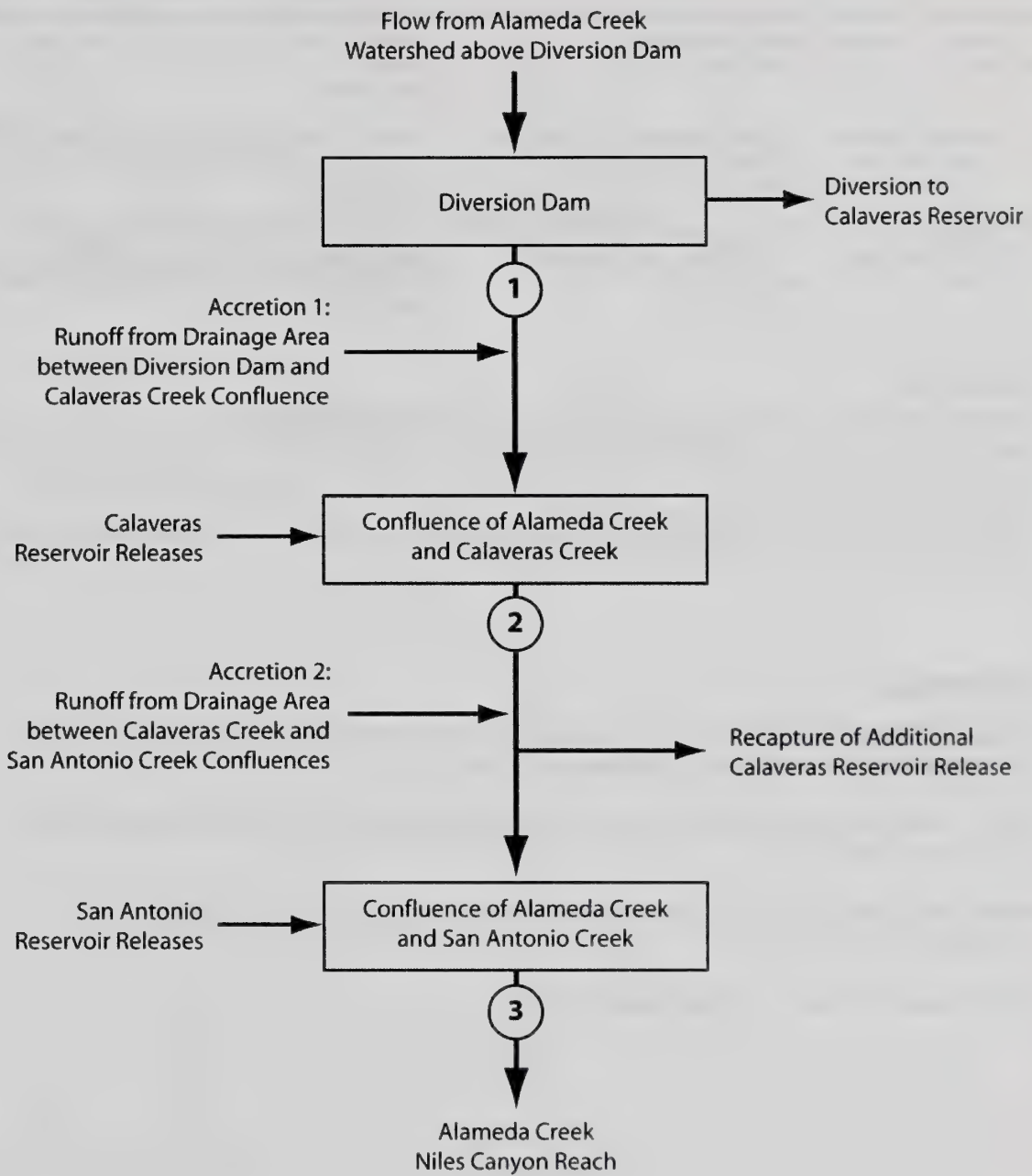
Flow at each of these locations was derived from HH/LSM output data combined with calculated flow for runoff volumes, using the methodology provided by the SFPUC (Hannaford, 2004). The basis of calculations for the flow at each location is shown in Table 6.

Reservoir storage was readily available from HH/LSM output data, and water surface elevations were calculated using SFPUC-supplied storage-elevation curves.

Complete post-processed results from the HH/LSM model output analysis are provided as attachment D.1.1. Additional analysis of lower Alameda Creek was also developed utilizing HH/LSM output and USGS gage data. This analysis is documented in Appendix D.3.



Figure 2: Alameda System Flow and Storage Analysis Locations



SOURCE: WRE, 2006, modified to include recapture and flow locations.

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Figure 3: Alameda Creek Water Balance Flowchart

Table 6: Calculation of Flows in Alameda Creek

Alameda Creek Flow Location	Unimpaired Flow	Current Impaired and Proposed Flows
1. Below the Diversion Dam	SFPUC Calculation Data Source: ^a	= (Unimpaired Flow) – (Diversion to Calaveras Reservoir) Data Source: ^{a,b}
2. Below the Calaveras Creek Confluence	= (Unimpaired Flow at 1) + (Accretion 1) + (Calaveras Reservoir inflow) Data Source: ^{a,b,c}	= (Flow at 1) + (Accretion 1) + (Calaveras Reservoir Release) + (Calaveras Reservoir Spill) Data Source: ^{b,c}
3. Below the San Antonio Creek Confluence	= (Unimpaired Flow at 2) + (Accretion 2) + (San Antonio Reservoir inflow) Data Source: ^{b,c}	= (Flow at 2) + (Accretion 2) + (San Antonio Reservoir Release) + (San Antonio Reservoir Spill) – (Calaveras Reservoir Release/Recapture) Data Source: ^{b,c}

Data Source Notes:

^a Unimpaired flow at Alameda Creek Diversion Dam is from the SFPUC, file "AlamedaCkOnlyAtDiversion.xls."

^b HH/LSM output source of data for existing and proposed program conditions for: diversion to Calaveras Reservoir; Calaveras Reservoir inflow; Calaveras Reservoir release/recapture; Calaveras Reservoir spill; San Antonio Reservoir inflow; San Antonio Reservoir release; San Antonio Reservoir spill.

^c Accretion 1 = average monthly runoff volume from drainage area between diversion dam and confluence of Alameda and Calaveras Creeks = (unimpaired inflow to San Antonio Reservoir) x (0.253).
Accretion 2 = average monthly runoff volume from drainage area between Calaveras/Alameda Creek and San Antonio/Alameda Creek confluences = (unimpaired inflow to San Antonio Reservoir) x (0.221).

References

Hannaford, Margaret A., Modeling of Alameda Creek Instream Release Requirements in LSM, 2004.SFPUC, Water Supply Options, June 2007.

SFPUC, Water Supply System Modeling Report, Hetch Hetchy/Local Simulation Model, Draft, January 2007.

Steiner, Dan, Unimpaired Flow Estimates for HH/LSM System East Bay Locales, Draft, August 19, 2006.

WRE, Alameda Creek Accretions Memo, 2006.

Attachment D.1-1

Post-processed HH/LSM Data for CDRP Impact Analysis

SUMMARY OF TABLES

Model Runs Compared:

File: HH-LSM ACDD Study Output.xls, Distributed 5/5/2009

Runs: Baseline Condition (2005), Calaveras Down

Base

265mgd Existing Setting, Calaveras and Crystal Springs Constrained

File: HH-LSM ACDD Study Output.xls, Distributed 5/5/2009

Runs: WSIP Prop. Program (2018), Calaveras Up

2018 ACDD Release

265 mgd with WSIP, Calaveras & Crystal Springs Capacity Restored, 20mgd R/C/GW, Water Transfer and Conjunctive Use

Index:

5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Summary of Tables & Charts Prepared from HH/LSM Output:

- 1 Diversion from Upper Alameda Ck to Calaveras Reservoir
- 2 Calaveras Release to Calaveras Ck
- 3 Flow in Alameda Ck (1) below Diversion Dam
- 4 Flow in Alameda Ck (2) below Calaveras Ck Confluence
- 5 Flow in Alameda Ck (3) below San Antonio Ck Confluence
- 6 Calaveras Reservoir Storage

Table A1.1

Estimated Average Annual ALAMEDA CREEK DIVERSION TO CALAVERAS under Various Conditions (AF per year)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Hydrologic Year Type	Abbrev.	Percentile	Base, Baseline Condition (2005), Calaveras Down	2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up
All	-		(a)	(b)
All	-		4,037	3,386
Wet	W	81-100%	3,977	3,577
Above Normal	AN	61-80%	4,510	5,686
Normal	N	41-60%	4,834	4,953
Below Normal	BN	21-40%	4,956	2,337
Dry	D	0-20%	1,823	296

(a) 265mgd Existing Setting, Calaveras and Crystal Springs Constrained

(b) 265 mgd with WSIP, Calaveras & Crystal Springs Capacity Restored, 20mgd R/C/GW, Water Transfer and Conjunctive Use

Table A1.2

Estimated Average Monthly ALAMEDA CREEK DIVERSION TO CALAVERAS Under Various Conditions (AF per month)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Base, Baseline Condition (2005), Calaveras Down												
All	8	77	635	694	684	693	677	429	111	17	8	5
Wet	7	128	1,093	415	185	307	637	904	227	42	18	12
Above Normal	11	159	691	722	325	596	1,284	542	139	23	11	7
Normal	7	35	634	972	815	1,123	813	332	87	8	5	3
Below Normal	7	42	536	1,024	1,587	1,042	395	246	64	6	4	3
Dry	7	16	222	314	473	382	238	124	38	3	3	2

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

All	0	39	641	913	813	359	422	192	6	0	0	0
Wet	0	79	985	1,006	142	186	530	620	29	0	0	0
Above Normal	0	95	844	1,835	1,542	263	860	247	0	0	0	0
Normal	0	12	902	1,172	1,320	936	549	62	0	0	0	0
Below Normal	0	7	386	508	911	409	87	30	0	0	0	0
Dry	0	0	92	14	99	5	76	11	0	0	0	0

Percent Change, Base vs 2018 ACDD Release

All	-100%	-49%	1%	32%	19%	-48%	-38%	-55%	-95%	-100%	-100%	-100%
Wet	-100%	-38%	-10%	142%	-23%	-39%	-17%	-31%	-87%	-100%	-100%	-100%
Above Normal	-100%	-40%	22%	154%	374%	-56%	-33%	-54%	-100%	-100%	-100%	-100%
Normal	-100%	-66%	42%	21%	62%	-17%	-32%	-81%	-100%	-100%	-100%	-100%
Below Normal	-100%	-83%	-28%	-50%	-43%	-61%	-78%	-88%	-100%	-100%	-100%	-100%
Dry	-100%	-100%	-59%	-96%	-79%	-99%	-68%	-91%	-100%	-100%	-100%	-100%

* Indicates an increase from zero release in Baseline Case. See tables above for actual increase.

Table A1.3

Estimated Monthly Statistics for ALAMEDA CREEK DIVERSION TO CALAVERAS (AF per month)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Base, Baseline Condition (2005), Calaveras Down												
Average	8	77	635	694	684	693	677	429	111	17	8	5
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Median	6	15	296	368	330	522	486	305	86	9	6	3
Maximum	52	1,108	3,087	3,627	3,535	2,808	3,250	2,078	583	230	110	74
Std. Deviation	8	183	777	850	888	703	693	423	96	32	13	9

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

Average	0	39	641	913	813	359	422	192	6	0	0	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Median	0	0	32	0	0	0	121	0	0	0	0	0
Maximum	0	958	4,987	5,279	5,168	5,355	2,888	2,003	240	0	0	0
Std. Deviation	0	162	1,061	1,401	1,292	775	618	419	36	0	0	0

Table A1.2b (Transposed)

Estimated Average Monthly ALAMEDA CREEK DIVERSION TO CALAVERAS Under Various Conditions (CFS)

5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Base, Baseline Condition (2005), Calaveras Down

	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	0	0	0	0	0	0
Nov	2	3	1	1	0	1
Dec	18	11	10	9	4	10
Jan	7	12	16	17	5	11
Feb	3	6	15	28	8	12
Mar	5	10	18	17	6	11
Apr	11	22	14	7	4	11
May	15	9	5	4	2	7
Jun	4	2	1	1	1	2
Jul	1	0	0	0	0	0
Aug	0	0	0	0	0	0
Sep	0	0	0	0	0	0

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	0	0	0	0	0	0
Nov	1	2	0	0	0	1
Dec	16	14	15	6	1	10
Jan	16	30	19	8	0	15
Feb	3	28	24	16	2	15
Mar	3	4	15	7	0	6
Apr	9	14	9	1	1	7
May	10	4	1	0	0	3
Jun	0	0	0	0	0	0
Jul	0	0	0	0	0	0
Aug	0	0	0	0	0	0
Sep	0	0	0	0	0	0

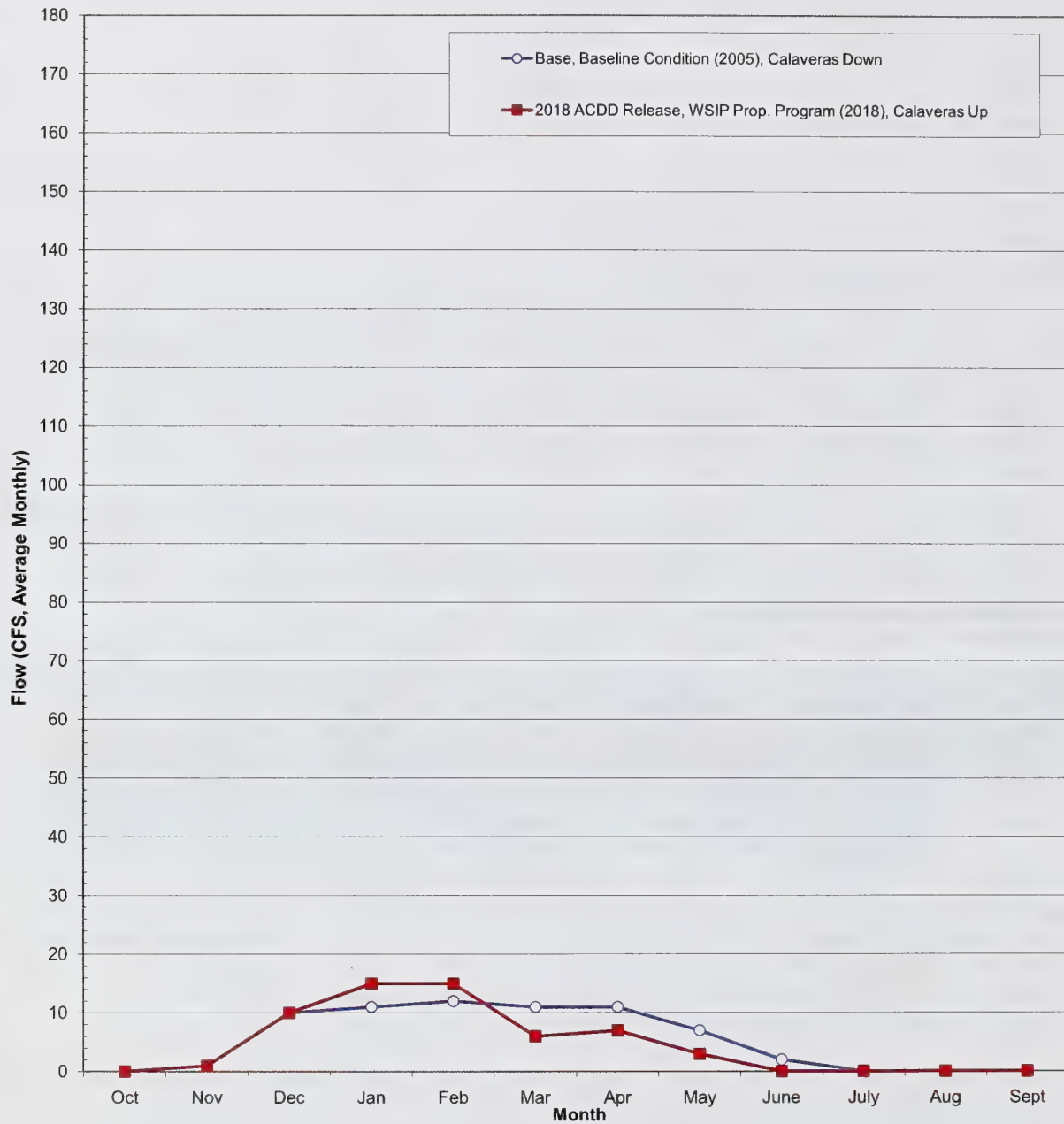
Delta and Percent Change, Base vs 2018 ACDD Release

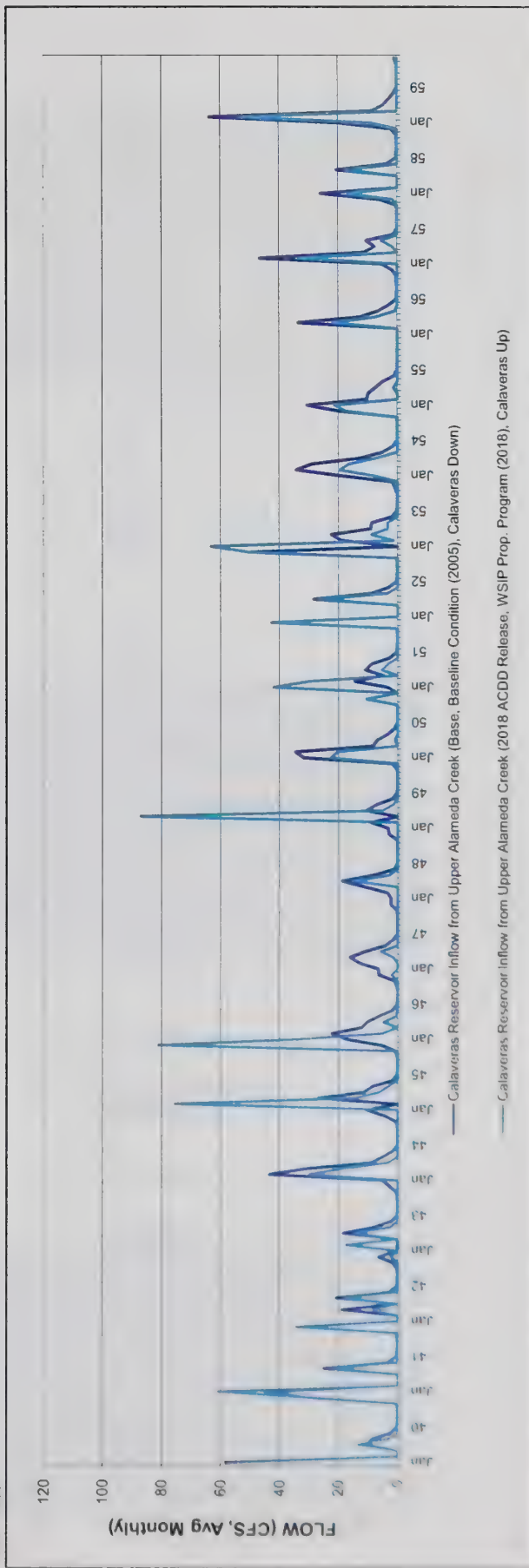
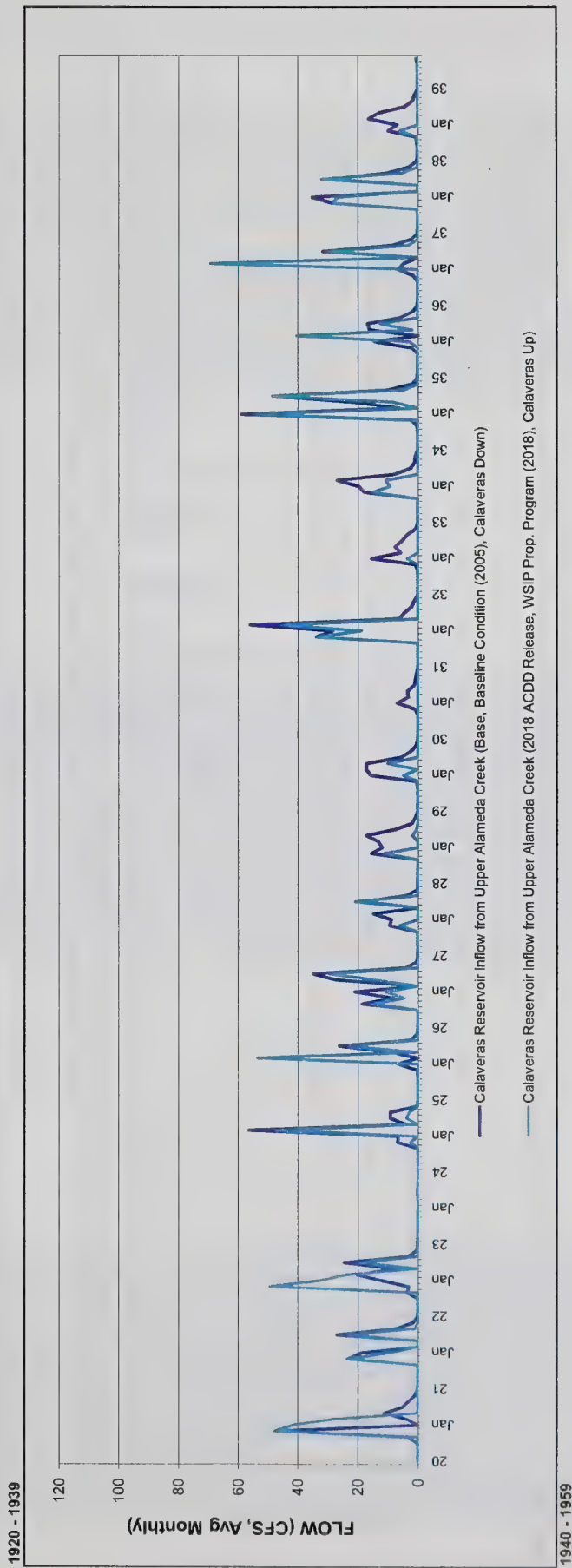
	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]
Nov	-1 [-50%]	-1 [-33%]	-1 [-100%]	-1 [-100%]	0 [0%]	0 [0%]
Dec	-2 [-11%]	3 [27%]	5 [50%]	-3 [-33%]	-3 [-75%]	0 [0%]
Jan	9 [129%]	18 [150%]	3 [19%]	-9 [-53%]	-5 [-100%]	4 [36%]
Feb	0 [0%]	22 [367%]	9 [60%]	-12 [-43%]	-6 [-75%]	3 [25%]
Mar	-2 [-40%]	-6 [-60%]	-3 [-17%]	-10 [-59%]	-6 [-100%]	-5 [-45%]
Apr	-2 [-18%]	-8 [-36%]	-5 [-36%]	-6 [-86%]	-3 [-75%]	-4 [-36%]
May	-5 [-33%]	-5 [-56%]	-4 [-80%]	-4 [-100%]	-2 [-100%]	-4 [-57%]
Jun	-4 [-100%]	-2 [-100%]	-1 [-100%]	-1 [-100%]	-1 [-100%]	-2 [-100%]
Jul	-1 [-100%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]
Aug	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]
Sep	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]

Key

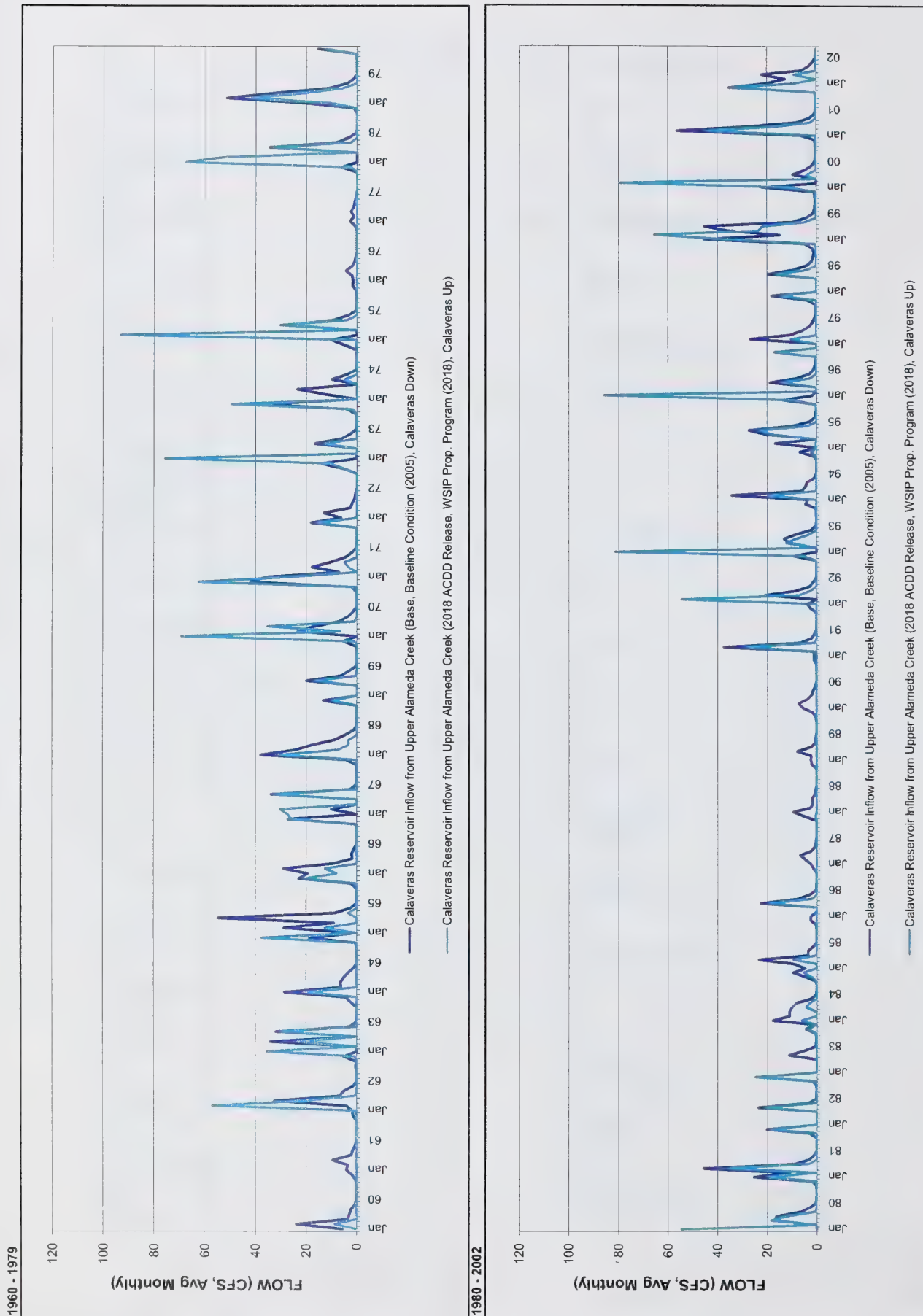
	< 0%
	> 0 to 5%
	> 5%

A1.4 - Average Monthly Flows ALAMEDA CREEK DIVERSION TO CALAVERAS RESERVOIR





A1.9 DIVERSION FROM ALAMEDA CREEK TO CALAVERAS RESERVOIR



A1.11 ALAMEDA CREEK DIVERSION TO CALAVERAS RESERVOIR

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)**Calaveras Reservoir Inflow from Upper Alameda Creek - CFS, Average Monthly**

Base - Calaveras Constrained

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	0	2	25	0	0	0	0	11	5	0	0	0
W	1998	0	4	18	0	0	0	0	19	9	4	2	1
W	1958	0	0	6	26	0	0	0	20	4	0	0	0
W	1941	0	0	31	45	0	0	0	25	3	0	0	0
W	1982	0	3	20	0	0	0	0	24	3	0	0	0
W	1995	0	1	7	0	17	0	20	27	10	3	1	0
W	1956	0	0	0	0	0	34	13	7	3	0	0	0
W	1952	0	0	43	0	0	0	28	9	3	0	0	0
W	1938	0	0	29	35	0	0	29	10	3	0	0	0
W	1997	0	17	0	0	26	11	6	3	1	1	0	0
W	1969	0	0	13	0	0	0	20	6	3	0	0	0
W	1973	0	6	14	0	0	0	17	6	3	0	0	0
W	1986	0	0	2	2	0	0	23	7	3	0	0	0
W	1980	0	0	15	0	0	17	16	6	3	0	0	0
W	1942	0	0	34	0	0	19	0	21	3	0	0	0
W	1967	0	0	27	0	10	0	0	34	3	0	0	0
AN	1963	0	0	5	0	0	34	0	32	3	0	0	0
AN	1940	0	0	1	58	0	0	11	8	2	0	0	0
AN	1965	0	1	19	0	28	9	55	9	3	0	0	0
AN	1996	0	0	14	2	0	0	19	8	3	1	0	0
AN	1922	0	0	24	19	0	0	27	7	2	0	0	0
AN	1975	0	0	5	10	0	0	28	9	3	0	0	0
AN	1974	0	4	37	0	13	23	0	10	4	0	0	0
AN	1978	0	0	6	0	0	0	35	8	3	0	0	0
AN	1993	0	0	9	0	0	11	13	8	2	0	0	0
AN	1951	0	11	0	3	14	5	11	9	3	0	0	0
AN	1943	0	2	6	0	0	0	18	8	2	0	0	0
AN	1927	0	19	8	21	0	27	35	4	0	0	0	0
AN	1937	0	0	1	7	5	0	32	8	2	0	0	0
AN	2000	0	1	1	22	0	0	9	4	2	1	0	0
AN	1921	0	3	48	0	4	11	5	3	1	0	0	0
AN	1999	1	1	5	45	15	36	45	10	4	1	1	0
AN	1923	0	4	3	12	20	8	25	3	0	0	0	0
N	1953	0	0	50	0	19	22	9	2	0	0	0	0
N	1928	0	0	10	9	15	0	18	4	0	0	0	0
N	1970	0	0	5	0	23	17	7	4	2	0	0	0
N	1984	0	4	0	18	11	11	10	8	2	0	0	0
N	1946	0	1	5	17	22	12	10	6	2	0	0	0
N	1926	0	0	0	7	0	9	26	2	0	0	0	0
N	1936	0	0	2	15	0	16	17	6	2	0	0	0
N	1945	0	0	4	10	0	27	11	8	2	0	0	0
N	1971	0	2	42	36	7	18	10	5	2	0	0	0
N	1935	0	0	2	59	6	22	49	10	2	0	0	0
N	1932	0	0	34	28	55	6	5	2	1	0	0	0
N	1979	0	0	1	21	51	33	11	4	1	0	0	0
N	1962	0	0	1	2	4	32	7	5	1	0	0	0
N	1949	0	0	3	3	9	0	11	7	2	0	0	0
N	1992	0	0	3	4	0	21	8	3	1	0	0	0
N	1981	0	0	2	25	11	46	9	3	1	0	0	0
BN	2001	0	0	1	6	56	27	8	3	1	0	0	0
BN	1930	0	0	1	16	17	17	5	2	1	0	0	0
BN	1954	0	1	2	19	34	29	12	5	2	0	0	0
BN	1968	0	0	4	38	24	18	9	5	1	0	0	0
BN	1959	0	0	2	20	63	9	5	3	1	0	0	0
BN	1925	0	0	7	6	56	4	9	9	0	0	0	0
BN	1944	0	0	3	5	43	31	9	5	1	0	0	0
BN	2002	0	1	35	20	12	22	6	3	1	0	0	0
BN	1950	0	0	2	32	34	8	7	3	1	0	0	0
BN	1966	0	2	23	19	29	10	2	2	1	0	0	0
BN	1955	0	0	20	31	10	10	7	5	1	0	0	0
BN	1957	0	0	2	5	46	11	8	10	1	0	0	0
BN	1934	0	0	18	20	27	8	2	1	1	0	0	0
BN	1985	0	4	9	5	9	23	4	3	2	0	0	0
BN	1991	0	0	1	1	1	38	7	2	1	0	0	0
BN	1929	0	0	16	12	13	17	8	2	1	0	0	0
BN	1964	0	2	5	28	6	6	5	3	1	0	0	0
D	1947	0	1	6	6	13	16	11	4	1	0	0	0
D	1994	0	0	4	3	34	6	4	4	1	0	0	0
D	1939	0	1	10	7	16	13	4	2	1	0	0	0
D	1948	0	0	2	2	3	11	19	1	1	0	0	0
D	1960	0	0	1	5	24	4	3	2	1	0	0	0
D	1972	0	0	18	6	13	3	1	1	1	0	0	0
D	1933	0	0	1	15	6	1	5	3	1	0	0	0
D	1961	0	0	2	4	3	10	2	2	1	0	0	0
D	1990	0	1	2	6	7	4	1	1	1	0	0	0
D	1987	0	0	1	2	4	7	2	1	1	0	0	0
D	1988	0	0	5	9	12	2	1	1	0	0	0	0
D	1989	0	0	2	2	2	8	1	1	1	0	0	0
D	1931	0	0	1	7	3	4	1	1	1	0	0	0
D	1976	0	0	2	2	2	4	2	1	1	0	0	0
D	1977	0	0	1	3	1	1	1	1	1	0	0	0
D	1924	0	0	0	0	0	0	0	0	0	0	0	0

A1.11 ALAMEDA CREEK DIVERSION TO CALAVERAS RESERVOIR

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

Calaveras Reservoir Inflow from Upper Alameda Creek - CFS, Average Monthly

2018 WSIP CSRE ACDD RH DT2300

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	0	0	25	0	0	0	0	0	0	0	0	0
W	1998	0	0	15	0	0	0	0	16	4	0	0	0
W	1958	0	0	2	17	0	0	0	17	0	0	0	0
W	1941	0	0	30	61	0	0	0	22	0	0	0	0
W	1982	0	0	19	0	0	0	0	21	0	0	0	0
W	1995	0	0	2	0	0	0	17	23	4	0	0	0
W	1956	0	0	0	0	0	22	8	1	0	0	0	0
W	1952	0	0	43	0	0	0	26	3	0	0	0	0
W	1938	0	0	28	27	0	0	32	5	0	0	0	0
W	1997	0	16	0	0	10	0	0	0	0	0	0	0
W	1969	0	0	10	0	0	0	16	1	0	0	0	0
W	1973	0	5	11	76	0	0	12	0	0	0	0	0
W	1986	0	0	0	0	0	0	19	2	0	0	0	0
W	1980	0	0	12	55	0	18	12	0	0	0	0	0
W	1942	0	0	34	0	0	8	0	17	0	0	0	0
W	1967	0	0	26	27	30	0	0	33	0	0	0	0
AN	1963	0	0	1	35	0	23	0	30	0	0	0	0
AN	1940	0	0	0	54	0	0	13	3	0	0	0	0
AN	1965	0	0	38	0	13	0	0	3	0	0	0	0
AN	1996	0	0	10	86	0	0	14	3	0	0	0	0
AN	1922	0	0	23	9	0	0	23	1	0	0	0	0
AN	1975	0	0	1	0	92	0	30	4	0	0	0	0
AN	1974	0	2	50	0	0	0	0	5	0	0	0	0
AN	1978	0	0	2	68	52	0	33	2	0	0	0	0
AN	1993	0	0	5	81	0	12	8	3	0	0	0	0
AN	1951	0	11	0	42	30	0	5	3	0	0	0	0
AN	1943	0	0	2	0	17	0	14	2	0	0	0	0
AN	1927	0	15	4	11	0	14	29	0	0	0	0	0
AN	1937	0	0	0	0	69	0	30	3	0	0	0	0
AN	2000	0	0	0	11	79	0	4	0	0	0	0	0
AN	1921	0	0	48	42	28	0	0	0	0	0	0	0
AN	1999	0	0	0	36	65	23	22	5	0	0	0	0
AN	1923	0	0	50	33	23	0	19	0	0	0	0	0
N	1953	0	0	50	63	1	9	3	3	0	0	0	0
N	1928	0	0	6	0	0	0	21	0	0	0	0	0
N	1970	0	0	1	69	6	35	1	0	0	0	0	0
N	1984	0	3	0	6	0	0	4	3	0	0	0	0
N	1946	0	0	81	34	5	0	5	0	0	0	0	0
N	1926	0	0	0	0	53	0	23	0	0	0	0	0
N	1936	0	0	0	3	40	2	13	0	0	0	0	0
N	1945	0	0	0	0	75	14	6	3	0	0	0	0
N	1971	0	0	62	27	0	3	5	0	0	0	0	0
N	1935	0	0	0	54	0	8	49	5	0	0	0	0
N	1932	0	0	34	19	44	0	0	0	0	0	0	0
N	1979	0	0	0	10	41	21	6	0	0	0	0	0
N	1962	0	0	0	0	56	21	1	0	0	0	0	0
N	1949	0	0	0	0	0	87	5	1	0	0	0	0
N	1992	0	0	0	0	54	7	3	0	0	0	0	0
N	1981	0	0	0	19	0	36	3	0	0	0	0	0
BN	2001	0	0	0	0	44	17	2	0	0	0	0	0
BN	1930	0	0	0	5	0	10	0	0	0	0	0	0
BN	1954	0	0	0	8	19	16	7	0	0	0	0	0
BN	1968	0	0	0	30	8	3	3	0	0	0	0	0
BN	1959	0	0	0	9	53	0	0	0	0	0	0	0
BN	1925	0	0	2	0	47	0	4	3	0	0	0	0
BN	1944	0	0	0	0	30	19	3	0	0	0	0	0
BN	2002	0	0	34	9	0	9	0	0	0	0	0	0
BN	1950	0	0	0	23	20	0	1	0	0	0	0	0
BN	1966	0	0	21	8	12	0	0	0	0	0	0	0
BN	1955	0	0	17	21	0	0	1	0	0	0	0	0
BN	1957	0	0	0	0	33	0	2	5	0	0	0	0
BN	1934	0	0	15	9	11	0	0	0	0	0	0	0
BN	1985	0	2	5	0	0	9	0	0	0	0	0	0
BN	1991	0	0	0	0	0	28	1	0	0	0	0	0
BN	1929	0	0	11	0	0	2	0	0	0	0	0	0
BN	1964	0	0	0	19	0	0	0	0	0	0	0	0
D	1947	0	0	2	0	0	1	6	0	0	0	0	0
D	1994	0	0	0	0	19	0	0	0	0	0	0	0
D	1939	0	0	6	0	0	0	0	0	0	0	0	0
D	1948	0	0	0	0	0	0	15	3	0	0	0	0
D	1960	0	0	0	0	9	0	0	0	0	0	0	0
D	1972	0	0	15	0	0	0	0	0	0	0	0	0
D	1933	0	0	0	4	0	0	0	0	0	0	0	0
D	1961	0	0	0	0	0	0	0	0	0	0	0	0
D	1990	0	0	0	0	0	0	0	0	0	0	0	0
D	1987	0	0	0	0	0	0	0	0	0	0	0	0
D	1988	0	0	0	0	0	0	0	0	0	0	0	0
D	1989	0	0	0	0	0	0	0	0	0	0	0	0
D	1931	0	0	0	0	0	0	0	0	0	0	0	0
D	1976	0	0	0	0	0	0	0	0	0	0	0	0
D	1977	0	0	0	0	0	0	0	0	0	0	0	0
D	1924	0	0	0	0	0	0	0	0	0	0	0	0

A1.11 ALAMEDA CREEK DIVERSION TO CALAVERAS RESERVOIR

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

Calaveras Reservoir Inflow from Upper Alameda Creek - CFS, Average Monthly

2018 WSIP CSRE ACDD RH DT2300 minus

Base - Calaveras Constrained

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	0	-2	0	0	0	0	0	-11	-5	0	0	0
W	1998	0	-4	-3	0	0	0	0	-3	-5	-4	-2	-1
W	1958	0	0	-4	-9	0	0	0	-3	-4	0	0	0
W	1941	0	0	-1	16	0	0	0	-3	-3	0	0	0
W	1982	0	-3	-2	0	0	0	0	-3	-3	0	0	0
W	1995	0	-1	-5	0	-16	0	-2	-5	-6	-3	-1	0
W	1956	0	0	0	0	0	-12	-5	-6	-3	0	0	0
W	1952	0	0	0	0	0	0	-2	-5	-3	0	0	0
W	1938	0	0	0	-8	0	0	3	-5	-3	0	0	0
W	1997	0	-1	0	0	-16	-11	-6	-3	-1	-1	0	0
W	1969	0	0	-3	0	0	0	-4	-6	-3	0	0	0
W	1973	0	-1	-3	76	0	0	-4	-6	-3	0	0	0
W	1986	0	0	-2	-2	0	0	-3	-6	-3	0	0	0
W	1980	0	0	-3	55	0	2	-4	-6	-3	0	0	0
W	1942	0	0	0	0	0	-11	0	-3	-3	0	0	0
W	1967	0	0	-1	27	20	0	0	-1	-3	0	0	0
AN	1963	0	0	-4	35	0	-12	0	-1	-3	0	0	0
AN	1940	0	0	-1	-5	0	0	3	-5	-2	0	0	0
AN	1965	0	-1	19	0	-16	-9	-55	-5	-3	0	0	0
AN	1996	0	0	-4	84	0	0	-5	-5	-3	-1	0	0
AN	1922	0	0	0	-10	0	0	-4	-6	-2	0	0	0
AN	1975	0	0	-4	-10	92	0	3	-5	-3	0	0	0
AN	1974	0	-2	13	0	-13	-23	0	-5	-4	0	0	0
AN	1978	0	0	-4	68	52	0	-1	-5	-3	0	0	0
AN	1993	0	0	-4	81	0	2	-5	-5	-2	0	0	0
AN	1951	0	0	0	39	15	-5	-6	-6	-3	0	0	0
AN	1943	0	-2	-4	0	17	0	-4	-6	-2	0	0	0
AN	1927	0	-4	-4	-10	0	-13	-5	-4	0	0	0	0
AN	1937	0	0	-1	-7	64	0	-2	-5	-2	0	0	0
AN	2000	0	-1	-1	-11	79	0	-6	-4	-2	-1	0	0
AN	1921	0	-3	0	42	24	-11	-5	-3	-1	0	0	0
AN	1999	-1	-1	-4	-10	50	-13	-23	-5	-4	-1	-1	0
AN	1923	0	-4	46	21	3	-8	-6	-3	0	0	0	0
N	1953	0	0	0	63	-17	-13	-6	-5	-2	0	0	0
N	1928	0	0	-3	-9	-15	0	3	-4	0	0	0	0
N	1970	0	0	-4	69	-17	18	-6	-4	-2	0	0	0
N	1984	0	-1	0	-12	-11	-11	-6	-6	-2	0	0	0
N	1946	0	-1	76	17	-17	-12	-5	-6	-2	0	0	0
N	1926	0	0	0	-7	53	-9	-3	-2	0	0	0	0
N	1936	0	0	-2	-12	40	-14	-4	-6	-2	0	0	0
N	1945	0	0	-4	-10	75	-13	-5	-5	-2	0	0	0
N	1971	0	-2	20	-9	-7	-14	-5	-5	-2	0	0	0
N	1935	0	0	-2	-5	-6	-14	0	-5	-2	0	0	0
N	1932	0	0	0	-10	-11	-6	-5	-2	-1	0	0	0
N	1979	0	0	-1	-11	-9	-12	-5	-4	-1	0	0	0
N	1962	0	0	-1	-2	52	-12	-6	-5	-1	0	0	0
N	1949	0	0	-3	-3	-9	87	-5	-6	-2	0	0	0
N	1992	0	0	-3	-4	54	-14	-6	-3	-1	0	0	0
N	1981	0	0	-2	-6	-11	-10	-6	-3	-1	0	0	0
BN	2001	0	0	-1	-6	-12	-11	-6	-3	-1	0	0	0
BN	1930	0	0	-1	-11	-17	-7	-5	-2	-1	0	0	0
BN	1954	0	-1	-2	-11	-14	-13	-5	-5	-2	0	0	0
BN	1968	0	0	-4	-8	-17	-14	-6	-5	-1	0	0	0
BN	1959	0	0	-2	-11	-10	-9	-5	-3	-1	0	0	0
BN	1925	0	0	-4	-6	-9	-4	-5	-6	0	0	0	0
BN	1944	0	0	-3	-5	-13	-12	-6	-5	-1	0	0	0
BN	2002	0	-1	-1	-11	-12	-13	-6	-3	-1	0	0	0
BN	1950	0	0	-2	-9	-14	-8	-6	-3	-1	0	0	0
BN	1966	0	-2	-2	-11	-16	-10	-2	-2	-1	0	0	0
BN	1955	0	0	-2	-9	-10	-10	-6	-5	-1	0	0	0
BN	1957	0	0	-2	-5	-13	-11	-6	-5	-1	0	0	0
BN	1934	0	0	-3	-10	-16	-8	-2	-1	-1	0	0	0
BN	1985	0	-3	-4	-5	-9	-14	-4	-3	-2	0	0	0
BN	1991	0	0	-1	-1	-1	-9	-6	-2	-1	0	0	0
BN	1929	0	0	-4	-12	-13	-16	-7	-2	-1	0	0	0
BN	1964	0	-2	-5	-9	-6	-6	-5	-3	-1	0	0	0
D	1947	0	-1	-4	-6	-13	-15	-5	-4	-1	0	0	0
D	1994	0	0	-4	-3	-15	-6	-4	-4	-1	0	0	0
D	1939	0	-1	-4	-7	-16	-13	-4	-2	-1	0	0	0
D	1948	0	0	-2	-2	-3	-11	-4	-5	-1	0	0	0
D	1960	0	0	-1	-6	-15	-4	-3	-2	-1	0	0	0
D	1972	0	0	-3	-6	-13	-3	-2	-1	-1	0	0	0
D	1933	0	0	-1	-12	-6	-8	-5	-3	-1	0	0	0
D	1961	0	0	-2	-4	-3	-10	-2	-2	-1	0	0	0
D	1990	0	-1	-2	-6	-7	-4	-2	-1	-1	0	0	0
D	1987	0	0	-1	-2	-4	-7	-2	-1	-1	0	0	0
D	1988	0	0	-4	-9	-2	-2	-2	-1	0	0	0	0
D	1989	0	0	-2	-2	-2	-8	-2	-1	0	0	0	0
D	1931	0	0	-1	-7	-3	-4	-1	-1	-1	0	0	0
D	1976	0	0	-2	-2	-2	-4	-2	-1	0	0	0	0
D	1977	0	0	-1	-3	-1	-2	-1	-1	0	0	0	0
D	1924	0	0	0	0	0	0	0	0	0	0	0	0

Table A2.1

Estimated Average Annual RELEASE FROM CALAVERAS RESERVOIR TO CALAVERAS CREEK under Various Conditions (AF per year)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Hydrologic Year Type	Abbrev.	Percentile	Base, Baseline Condition (2005), Calaveras Down	2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up
			(a)	(b)
All	-		11,249	11,268
Wet	W	81-100%	42,623	37,191
Above Normal	AN	61-80%	12,423	8,851
Normal	N	41-60%	1,831	2,924
Below Normal	BN	21-40%	0	3,205
Dry	D	0-20%	0	4,826

(a) 265mgd Existing Setting, Calaveras and Crystal Springs Constrained

(b) 265 mgd with WSIP, Calaveras & Crystal Springs Capacity Restored, 20mgd R/C/GW, Water Transfer and Conjunctive Use

Table A2.2

Estimated Average Monthly RELEASE FROM CALAVERAS RESERVOIR TO CALAVERAS CREEK Under Various Conditions (AF per month)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Base, Baseline Condition (2005), Calaveras Down												
All	0	0	420	2,453	4,645	2,656	1,076	0	0	0	0	0
Wet	0	0	1,741	9,267	16,622	9,968	5,024	0	0	0	0	0
Above Normal	0	0	184	2,766	5,917	3,096	459	0	0	0	0	0
Normal	0	0	216	364	898	353	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

All	421	231	262	1,256	3,673	2,639	1,126	122	297	410	421	411
Wet	423	196	951	4,980	14,517	9,759	4,978	14	187	376	407	403
Above Normal	415	194	43	550	3,051	2,624	459	32	256	401	417	409
Normal	423	252	93	166	183	120	7	100	320	420	426	413
Below Normal	422	240	96	186	200	218	60	173	346	424	427	414
Dry	423	276	151	508	669	624	235	294	377	427	428	414

Percent Change, Base vs 2018 ACDD Release

All	*	*	-38%	-49%	-21%	-1%	5%	*	*	*	*	*
Wet	*	*	-45%	-46%	-13%	-2%	-1%	*	*	*	*	*
Above Normal	*	*	-77%	-80%	-48%	-15%	0%	*	*	*	*	*
Normal	*	*	-57%	-54%	-80%	-66%	*	*	*	*	*	*
Below Normal	*	*	*	*	*	*	*	*	*	*	*	*
Dry	*	*	*	*	*	*	*	*	*	*	*	*

* Indicates an increase from zero release in Baseline Case. See tables above for actual increase.

Table A2.3

Estimated Monthly Statistics for RELEASE FROM CALAVERAS RESERVOIR TO CALAVERAS CREEK (AF per month)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Base, Baseline Condition (2005), Calaveras Down												
Average	0	0	420	2,453	4,645	2,656	1,076	0	0	0	0	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Median	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	0	0	20,296	34,528	50,376	44,855	26,722	0	0	0	0	0
Std. Deviation	0	0	2,425	5,974	9,241	6,797	4,342	0	0	0	0	0

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

Average	421	231	262	1,256	3,673	2,639	1,126	122	297	410	421	411
Minimum	354	0	0	0	0	0	0	0	0	154	298	331
Median	424	276	0	0	330	386	0	67	321	420	424	413
Maximum	430	298	13,017	34,482	49,687	44,754	26,566	430	417	430	430	417
Std. Deviation	12	97	1,446	4,526	8,156	6,599	4,296	137	86	38	16	10

Table A2.2b (Transposed)

Estimated Average Monthly RELEASE FROM CALAVERAS RESERVOIR TO CALAVERAS CREEK Under Various Conditions (CFS)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Base, Baseline Condition (2005), Calaveras Down

	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	0	0	0	0	0	0
Nov	0	0	0	0	0	0
Dec	28	3	4	0	0	7
Jan	151	45	6	0	0	40
Feb	297	106	16	0	0	83
Mar	162	50	6	0	0	43
Apr	84	8	0	0	0	18
May	0	0	0	0	0	0
June	0	0	0	0	0	0
July	0	0	0	0	0	0
Aug	0	0	0	0	0	0
Sept	0	0	0	0	0	0

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	7	7	7	7	7	7
Nov	3	3	4	4	5	4
Dec	15	1	2	2	2	4
Jan	81	9	3	3	8	20
Feb	259	54	3	4	12	66
Mar	159	43	2	4	10	43
Apr	84	8	0	1	4	19
May	0	1	2	3	5	2
June	3	4	5	6	6	5
July	6	7	7	7	7	7
Aug	7	7	7	7	7	7
Sept	7	7	7	7	7	7

Delta and Percent Change, Base vs 2018 ACDD Release

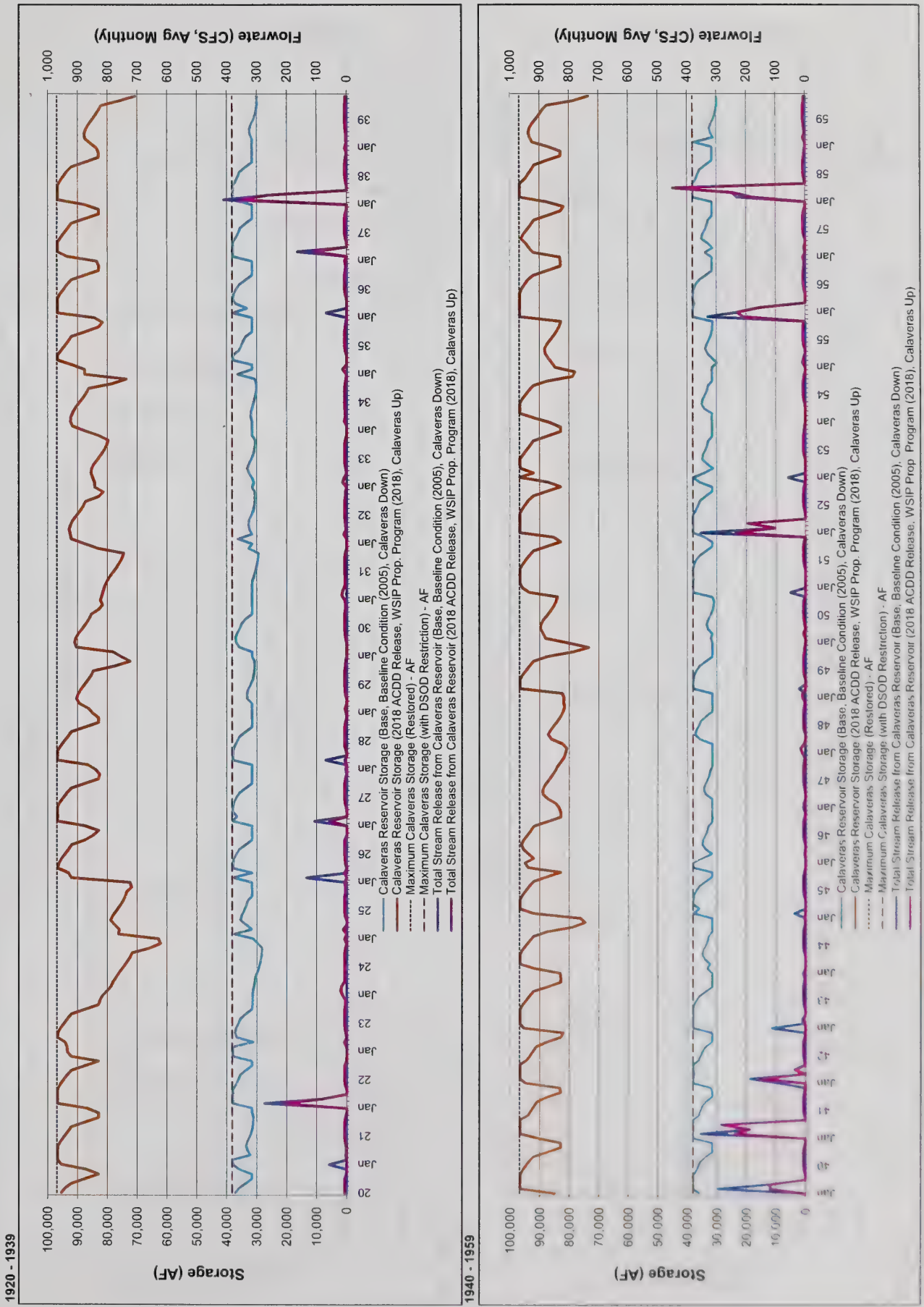
	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	7 *	7 *	7 *	7 *	7 *	7 *
Nov	3 *	3 *	4 *	4 *	5 *	4 *
Dec	-13 [-46%]	-2 [-67%]	-2 [-50%]	2 *	2 *	-3 [-43%]
Jan	-70 [-46%]	-36 [-80%]	-3 [-50%]	3 *	8 *	-20 [-50%]
Feb	-38 [-13%]	-52 [-49%]	-13 [-81%]	4 *	12 *	-17 [-20%]
Mar	-3 [-2%]	-7 [-14%]	-4 [-67%]	4 *	10 *	0 [0%]
Apr	0 [0%]	0 [0%]	0 [0%]	1 *	4 *	1 [6%]
May	0 [0%]	1 *	2 *	3 *	5 *	2 *
June	3 *	4 *	5 *	6 *	6 *	5 *
July	6 *	7 *	7 *	7 *	7 *	7 *
Aug	7 *	7 *	7 *	7 *	7 *	7 *
Sept	7 *	7 *	7 *	7 *	7 *	7 *

Key:  > 0% * Indicates an increase from zero release in Baseline Case. See tables above for actual increase
 < 0 to -5%
 < -5%

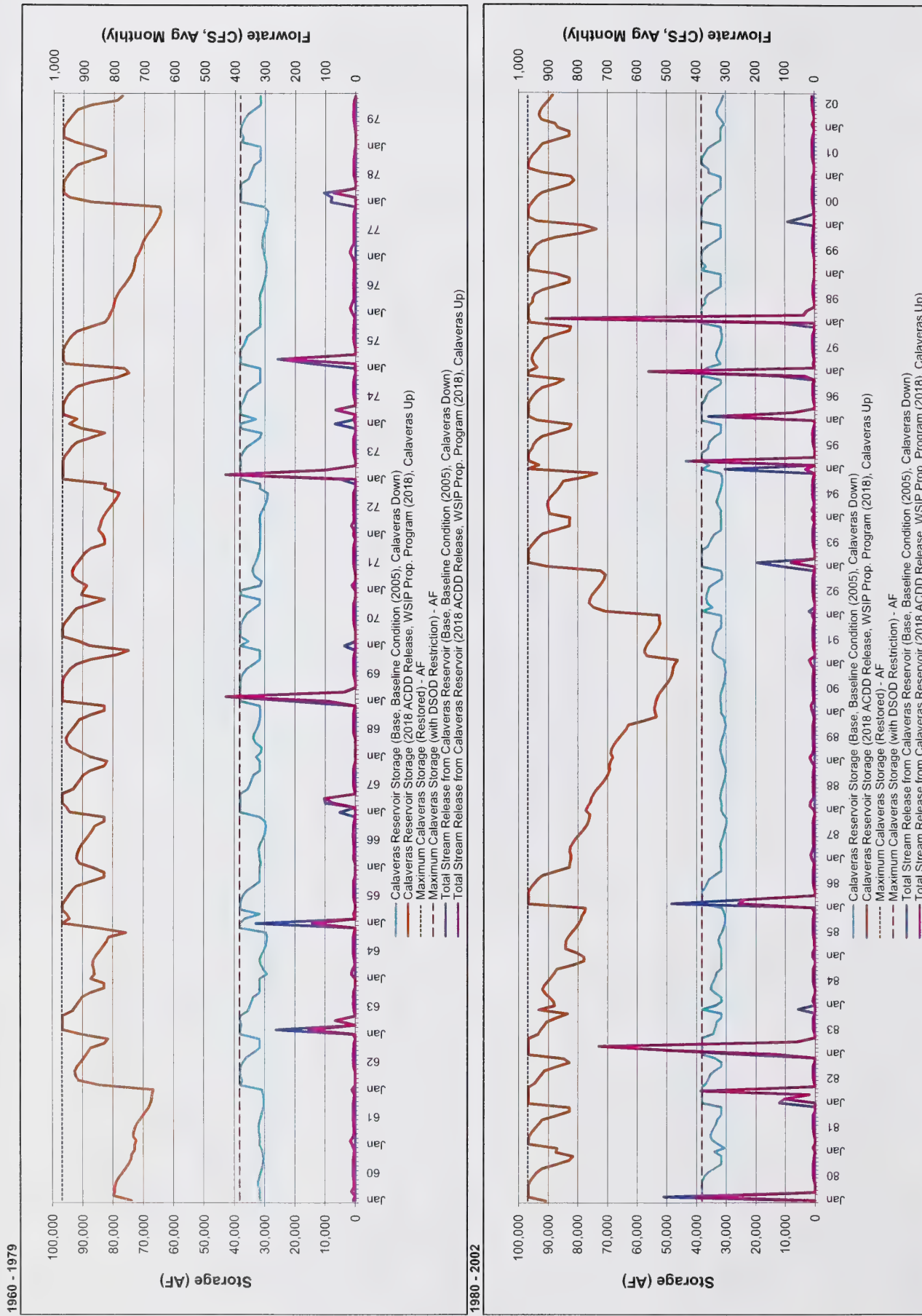
A2.4 - Average Monthly Flows RELEASE FROM CALAVERAS RESERVOIR TO CALAVERAS CREEK



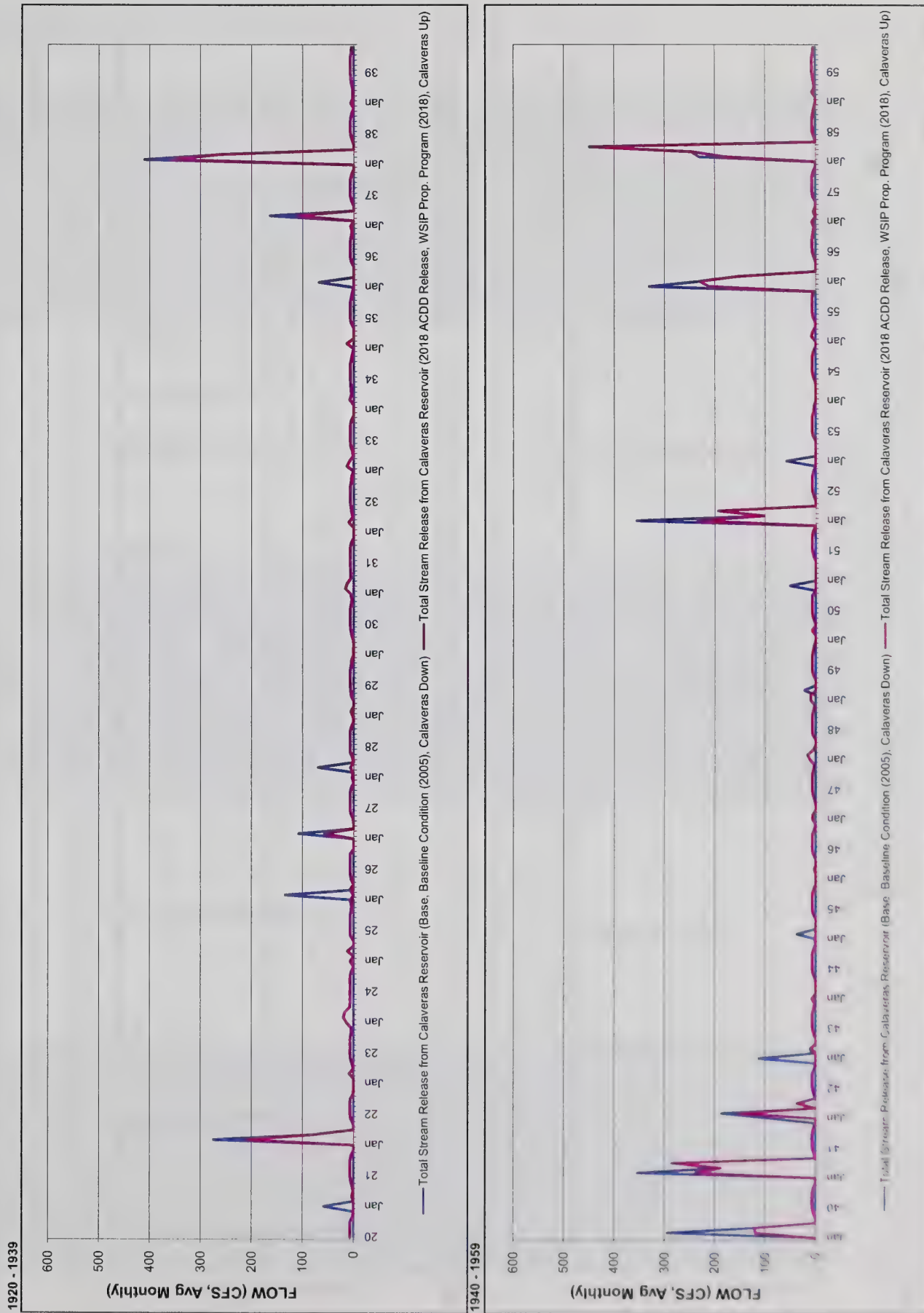
A2.9a CHRONOLOGICAL CALAVERAS STORAGE AND RELEASE TO CALAVERAS CREEK



A2.9a CHRONOLOGICAL CALAVERAS STORAGE AND RELEASE TO CALAVERAS CREEK

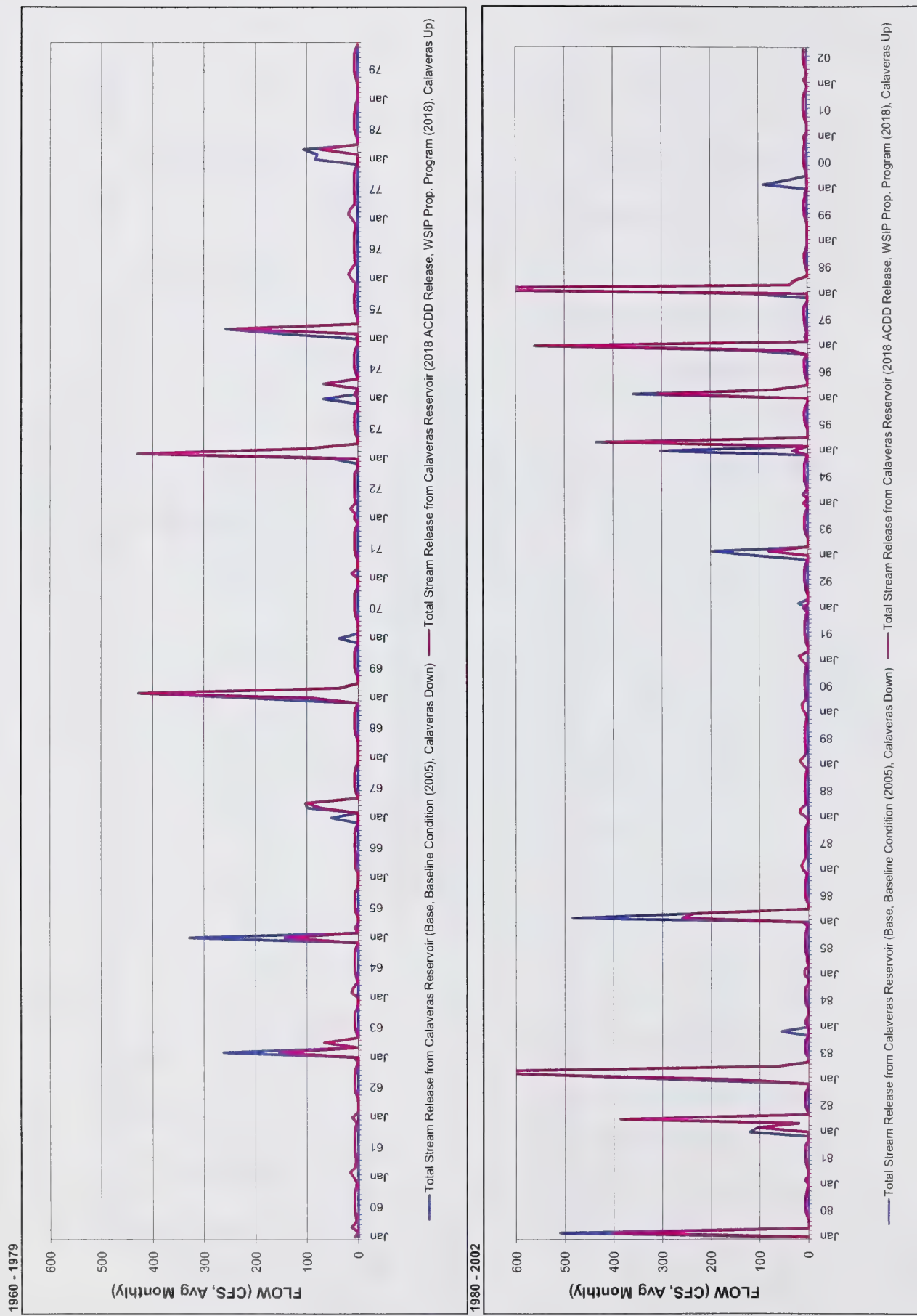


CHRONOLOGICAL CALAVERAS RELEASE TO CALAVERAS CREEK



Case 2:18-cv-01161-MJM Document 1-1 Filed 05/15/2009

CHRONOLOGICAL CALAVERAS RELEASE TO CALAVERAS CREEK



A2.11 CALAVERAS RELEASE TO CALAVERAS CREEK

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

Total Stream Release from Calaveras Reservoir - CFS, Average Monthly

Base - Calaveras Constrained

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	0	0	0	261	482	730	65	0	0	0	0	0
W	1998	0	0	0	117	899	38	28	0	0	0	0	0
W	1958	0	0	0	0	229	247	449	0	0	0	0	0
W	1941	0	0	0	0	351	190	285	0	0	0	0	0
W	1982	0	0	0	121	103	22	387	0	0	0	0	0
W	1995	0	0	0	303	0	434	0	0	0	0	0	0
W	1956	0	0	330	230	153	0	0	0	0	0	0	0
W	1952	0	0	0	355	103	194	0	0	0	0	0	0
W	1938	0	0	0	0	406	262	0	0	0	0	0	0
W	1997	0	0	123	562	0	0	0	0	0	0	0	0
W	1969	0	0	0	209	424	38	0	0	0	0	0	0
W	1973	0	0	0	50	426	103	0	0	0	0	0	0
W	1986	0	0	0	0	480	239	0	0	0	0	0	0
W	1980	0	0	0	61	506	0	0	0	0	0	0	0
W	1942	0	0	0	90	185	0	34	0	0	0	0	0
W	1967	0	0	0	52	0	99	103	0	0	0	0	0
AN	1963	0	0	0	9	260	0	64	0	0	0	0	0
AN	1940	0	0	0	0	292	122	0	0	0	0	0	0
AN	1965	0	0	0	329	0	0	0	0	0	0	0	0
AN	1996	0	0	0	0	355	73	0	0	0	0	0	0
AN	1922	0	0	0	0	272	82	0	0	0	0	0	0
AN	1975	0	0	0	0	142	258	0	0	0	0	0	0
AN	1974	0	0	0	68	0	0	67	0	0	0	0	0
AN	1978	0	0	0	83	78	106	0	0	0	0	0	0
AN	1993	0	0	0	106	194	0	0	0	0	0	0	0
AN	1951	0	0	51	0	0	0	0	0	0	0	0	0
AN	1943	0	0	0	113	6	11	0	0	0	0	0	0
AN	1927	0	0	0	0	107	0	0	0	0	0	0	0
AN	1937	0	0	0	0	0	164	0	0	0	0	0	0
AN	2000	0	0	0	0	89	41	0	0	0	0	0	0
AN	1921	0	0	0	59	0	0	0	0	0	0	0	0
AN	1999	0	0	0	0	0	0	0	0	0	0	0	0
AN	1923	0	0	0	0	0	0	0	0	0	0	0	0
N	1953	0	0	0	58	0	0	0	0	0	0	0	0
N	1928	0	0	0	0	0	69	0	0	0	0	0	0
N	1970	0	0	0	37	0	0	0	0	0	0	0	0
N	1984	0	0	58	0	0	0	0	0	0	0	0	0
N	1946	0	0	0	0	0	0	0	0	0	0	0	0
N	1926	0	0	0	0	133	0	0	0	0	0	0	0
N	1936	0	0	0	0	67	0	0	0	0	0	0	0
N	1945	0	0	0	0	37	0	0	0	0	0	0	0
N	1971	0	0	0	0	0	0	0	0	0	0	0	0
N	1935	0	0	0	0	0	0	0	0	0	0	0	0
N	1932	0	0	0	0	0	0	0	0	0	0	0	0
N	1979	0	0	0	0	0	0	0	0	0	0	0	0
N	1962	0	0	0	0	0	0	0	0	0	0	0	0
N	1949	0	0	0	0	0	22	0	0	0	0	0	0
N	1992	0	0	0	0	19	0	0	0	0	0	0	0
N	1981	0	0	0	0	0	0	0	0	0	0	0	0
BN	2001	0	0	0	0	0	0	0	0	0	0	0	0
BN	1930	0	0	0	0	0	0	0	0	0	0	0	0
BN	1954	0	0	0	0	0	0	0	0	0	0	0	0
BN	1968	0	0	0	0	0	0	0	0	0	0	0	0
BN	1959	0	0	0	0	0	0	0	0	0	0	0	0
BN	1925	0	0	0	0	0	0	0	0	0	0	0	0
BN	1944	0	0	0	0	0	0	0	0	0	0	0	0
BN	2002	0	0	0	0	0	0	0	0	0	0	0	0
BN	1950	0	0	0	0	0	0	0	0	0	0	0	0
BN	1966	0	0	0	0	0	0	0	0	0	0	0	0
BN	1955	0	0	0	0	0	0	0	0	0	0	0	0
BN	1957	0	0	0	0	0	0	0	0	0	0	0	0
BN	1934	0	0	0	0	0	0	0	0	0	0	0	0
BN	1985	0	0	0	0	0	0	0	0	0	0	0	0
BN	1991	0	0	0	0	0	0	0	0	0	0	0	0
BN	1929	0	0	0	0	0	0	0	0	0	0	0	0
BN	1964	0	0	0	0	0	0	0	0	0	0	0	0
D	1947	0	0	0	0	0	0	0	0	0	0	0	0
D	1994	0	0	0	0	0	0	0	0	0	0	0	0
D	1939	0	0	0	0	0	0	0	0	0	0	0	0
D	1948	0	0	0	0	0	0	0	0	0	0	0	0
D	1960	0	0	0	0	0	0	0	0	0	0	0	0
D	1972	0	0	0	0	0	0	0	0	0	0	0	0
D	1933	0	0	0	0	0	0	0	0	0	0	0	0
D	1961	0	0	0	0	0	0	0	0	0	0	0	0
D	1990	0	0	0	0	0	0	0	0	0	0	0	0
D	1987	0	0	0	0	0	0	0	0	0	0	0	0
D	1988	0	0	0	0	0	0	0	0	0	0	0	0
D	1989	0	0	0	0	0	0	0	0	0	0	0	0
D	1931	0	0	0	0	0	0	0	0	0	0	0	0
D	1976	0	0	0	0	0	0	0	0	0	0	0	0
D	1977	0	0	0	0	0	0	0	0	0	0	0	0
D	1924	0	0	0	0	0	0	0	0	0	0	0	0

A2.11 CALAVERAS RELEASE TO CALAVERAS CREEK

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

Total Stream Release from Calaveras Reservoir - CFS, Average Monthly

2018 WSIP CSRE ACDD RH DT2300

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	7	2	0	140	481	728	62	0	1	6	7	7
W	1998	7	1	0	0	887	36	25	0	0	3	5	6
W	1958	7	5	0	0	178	245	446	0	3	5	7	7
W	1941	7	5	0	0	236	188	283	0	3	6	7	7
W	1982	7	0	0	1	102	20	384	0	3	7	7	7
W	1995	7	4	0	31	0	417	0	0	0	4	6	7
W	1956	7	5	212	229	152	0	0	0	4	7	7	7
W	1952	7	5	0	234	102	192	0	0	4	7	7	7
W	1938	7	5	0	0	354	260	0	0	4	7	7	7
W	1997	7	0	34	561	0	5	1	4	6	6	7	7
W	1969	7	5	0	88	423	36	0	0	3	7	7	7
W	1973	7	0	0	0	425	101	0	0	4	7	7	7
W	1986	7	5	2	11	256	237	0	0	4	7	7	7
W	1980	7	4	0	0	399	0	0	0	4	7	7	7
W	1942	7	4	0	0	150	0	37	0	4	7	7	7
W	1967	7	4	0	0	0	73	101	0	4	7	7	7
AN	1963	6	5	0	0	153	0	66	0	4	7	7	7
AN	1940	7	5	4	0	118	120	0	0	4	7	7	7
AN	1965	7	4	0	143	0	7	0	0	4	7	7	7
AN	1996	7	5	0	0	303	71	0	0	4	6	6	7
AN	1922	7	5	0	0	210	80	0	0	5	7	7	7
AN	1975	7	4	0	3	0	243	0	0	3	6	7	7
AN	1974	7	0	0	0	6	0	64	0	3	6	7	7
AN	1978	7	5	0	0	0	72	0	0	3	7	7	7
AN	1993	7	5	0	0	80	0	0	0	4	7	7	7
AN	1951	7	0	0	0	0	0	0	0	4	7	7	7
AN	1943	7	2	0	0	0	9	0	0	4	7	7	7
AN	1927	7	0	0	0	56	0	0	1	6	7	7	7
AN	1937	7	5	3	6	0	110	0	0	5	7	7	7
AN	2000	7	4	4	0	0	0	0	2	5	6	7	7
AN	1921	7	2	0	0	0	3	1	3	6	7	7	7
AN	1999	6	3	0	0	0	0	0	0	2	6	6	7
AN	1923	7	1	0	0	0	9	0	3	7	7	7	7
N	1953	7	5	0	0	0	0	0	0	5	7	7	7
N	1928	7	5	0	3	2	6	0	3	7	7	7	7
N	1970	7	5	0	0	0	0	0	3	5	7	7	7
N	1984	6	0	0	0	8	4	0	0	5	7	7	7
N	1946	7	4	0	0	0	3	0	0	5	7	7	7
N	1926	7	5	5	7	0	8	0	5	7	7	7	7
N	1936	7	5	3	0	0	0	0	0	5	7	7	7
N	1945	7	4	0	2	0	0	0	0	5	7	7	7
N	1971	7	1	0	0	12	0	0	2	5	7	7	7
N	1935	7	5	3	0	13	0	0	0	5	7	7	7
N	1932	7	5	0	0	0	10	2	4	6	7	7	7
N	1979	7	5	4	0	0	0	0	3	6	7	7	7
N	1962	7	5	3	12	0	0	0	1	5	7	7	7
N	1949	7	5	2	10	10	0	0	0	5	7	7	7
N	1992	7	5	2	9	0	0	0	4	5	7	7	7
N	1981	7	5	3	0	8	0	0	3	5	7	7	7
BN	2001	7	5	4	6	0	0	0	4	6	7	7	7
BN	1930	7	5	4	0	1	0	1	4	6	7	7	7
BN	1954	7	4	3	0	0	0	0	1	5	7	7	7
BN	1968	7	5	0	0	0	0	0	1	6	7	7	7
BN	1959	7	5	3	0	0	7	2	4	6	7	7	7
BN	1925	7	5	0	7	0	12	0	0	7	7	7	7
BN	1944	7	5	2	8	0	0	0	1	5	7	7	7
BN	2002	7	4	0	0	6	0	0	3	6	7	7	7
BN	1950	7	5	3	0	0	7	0	3	6	7	7	7
BN	1966	7	1	0	0	0	6	5	5	6	7	7	7
BN	1955	7	5	0	0	8	6	0	1	6	7	7	7
BN	1957	7	5	3	8	0	4	0	0	8	7	7	7
BN	1934	7	5	0	0	0	8	4	6	6	7	7	7
BN	1985	7	0	0	9	8	0	3	3	5	7	7	7
BN	1991	7	5	4	13	19	0	0	4	6	7	7	7
BN	1929	7	5	0	1	5	0	0	5	6	7	7	7
BN	1964	7	1	0	0	13	10	1	3	6	7	7	7
D	1947	7	3	0	7	6	0	0	2	6	7	7	7
D	1994	7	5	0	10	0	10	2	2	6	7	7	7
D	1939	7	4	0	6	2	2	2	5	6	7	7	7
D	1948	7	5	3	11	16	4	0	0	6	7	7	7
D	1960	7	5	4	7	0	13	4	4	6	7	7	7
D	1972	7	5	0	7	5	14	5	6	6	7	7	7
D	1933	7	5	4	0	13	8	1	3	6	7	7	7
D	1961	7	4	3	9	16	6	5	5	6	7	7	7
D	1990	7	4	3	7	12	13	5	5	6	7	7	7
D	1987	7	5	3	11	14	10	5	6	6	7	7	7
D	1988	7	5	0	3	17	16	5	6	7	7	7	7
D	1989	7	5	3	11	17	8	5	6	7	7	7	7
D	1931	7	5	4	6	16	13	6	6	6	7	7	7
D	1976	7	4	3	12	18	12	5	6	7	7	7	7
D	1977	7	5	4	11	18	15	6	6	7	7	7	7
D	1924	7	5	5	14	20	17	7	7	7	7	7	7

A2.11 CALAVERAS RELEASE TO CALAVERAS CREEK

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

Total Stream Release from Calaveras Reservoir - CFS, Average Monthly

2018 WSIP CSRE ACDD RH DT2300 minus

Base - Calaveras Constrained

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	7	2	0	-121	-1	-2	-3	0	1	6	7	7
W	1998	7	1	0	-117	-12	-2	-3	0	0	3	5	6
W	1958	7	5	0	0	-50	-2	-3	0	3	6	7	7
W	1941	7	5	0	0	-115	-2	-3	0	3	6	7	7
W	1982	7	0	0	-120	-1	-2	-3	0	3	7	7	7
W	1995	7	4	0	-271	0	-17	0	0	0	4	6	7
W	1956	7	5	-118	-1	-1	0	0	0	4	7	7	7
W	1952	7	5	0	-121	-1	-2	0	0	4	7	7	7
W	1938	7	5	0	0	-52	-2	0	0	4	7	7	7
W	1997	7	0	-89	-1	0	5	1	4	6	6	7	7
W	1969	7	5	0	-120	-1	-2	0	0	3	7	7	7
W	1973	7	0	0	-50	-1	-2	0	0	4	7	7	7
W	1986	7	5	2	11	-223	-2	0	0	4	7	7	7
W	1980	7	4	0	-61	-107	0	0	0	4	7	7	7
W	1942	7	4	0	-90	-35	0	2	0	4	7	7	7
W	1967	7	4	0	-52	0	-25	-3	0	4	7	7	7
AN	1963	6	5	0	-9	-107	0	2	0	4	7	7	7
AN	1940	7	5	4	0	-174	-2	0	0	4	7	7	7
AN	1965	7	4	0	-185	0	7	0	0	4	7	7	7
AN	1996	7	5	0	0	-52	-2	0	0	4	6	6	7
AN	1922	7	5	0	0	-62	-2	0	0	5	7	7	7
AN	1975	7	4	0	3	-142	-15	0	0	3	6	7	7
AN	1974	7	0	0	-68	6	0	-3	0	3	6	7	7
AN	1978	7	5	0	-83	-78	-33	0	0	3	7	7	7
AN	1993	7	5	0	-106	-115	0	0	0	4	7	7	7
AN	1951	7	0	-51	0	0	0	0	0	4	7	7	7
AN	1943	7	2	0	-113	-6	-2	0	0	4	7	7	7
AN	1927	7	0	0	0	-50	0	0	1	6	7	7	7
AN	1937	7	5	3	6	0	-53	0	0	5	7	7	7
AN	2000	7	4	4	0	-89	-41	0	2	5	6	7	7
AN	1921	7	2	0	-59	0	3	1	3	6	7	7	7
AN	1999	6	3	0	0	0	0	0	0	2	6	6	7
AN	1923	7	1	0	0	0	9	0	3	7	7	7	7
N	1953	7	5	0	-58	0	0	0	0	5	7	7	7
N	1928	7	5	0	3	2	-63	0	3	7	7	7	7
N	1970	7	5	0	-37	0	0	0	3	5	7	7	7
N	1984	6	0	-56	0	8	4	0	0	5	7	7	7
N	1946	7	4	0	0	0	3	0	0	5	7	7	7
N	1926	7	5	5	7	-133	8	0	5	7	7	7	7
N	1936	7	5	3	0	-67	0	0	0	5	7	7	7
N	1945	7	4	0	2	-37	0	0	0	5	7	7	7
N	1971	7	1	0	0	12	0	0	2	5	7	7	7
N	1935	7	5	3	0	13	0	0	0	5	7	7	7
N	1932	7	5	0	0	0	10	2	4	6	7	7	7
N	1979	7	5	4	0	0	0	0	3	6	7	7	7
N	1962	7	5	3	12	0	0	0	1	5	7	7	7
N	1949	7	5	2	10	10	-22	0	0	5	7	7	7
N	1992	7	5	2	9	-19	0	0	4	5	7	7	7
N	1981	7	5	3	0	8	0	0	3	5	7	7	7
BN	2001	7	5	4	6	0	0	0	4	6	7	7	7
BN	1930	7	5	4	0	1	0	1	4	6	7	7	7
BN	1954	7	4	3	0	0	0	0	1	5	7	7	7
BN	1968	7	5	0	0	0	0	0	1	6	7	7	7
BN	1959	7	5	3	0	0	7	2	4	6	7	7	7
BN	1925	7	5	0	7	0	12	0	0	7	7	7	7
BN	1944	7	5	2	8	0	0	0	1	5	7	7	7
BN	2002	7	4	0	0	6	0	0	3	6	7	7	7
BN	1950	7	5	3	0	0	7	0	3	6	7	7	7
BN	1966	7	1	0	0	0	6	5	5	6	7	7	7
BN	1955	7	5	0	0	8	6	0	1	6	7	7	7
BN	1957	7	5	3	8	0	4	0	0	6	7	7	7
BN	1934	7	5	0	0	0	8	4	6	6	7	7	7
BN	1985	7	0	0	9	8	0	3	3	5	7	7	7
BN	1991	7	5	4	13	19	0	0	4	6	7	7	7
BN	1929	7	5	0	1	5	0	0	6	6	7	7	7
BN	1964	7	1	0	0	13	10	1	3	6	7	7	7
D	1947	7	3	0	7	6	0	0	2	6	7	7	7
D	1994	7	5	0	10	0	10	2	2	6	7	7	7
D	1939	7	4	0	6	2	2	2	5	6	7	7	7
D	1948	7	5	3	11	16	4	0	6	6	7	7	7
D	1960	7	5	4	7	0	13	4	4	6	7	7	7
D	1972	7	5	0	7	5	14	5	6	6	7	7	7
D	1933	7	5	4	0	13	8	1	3	6	7	7	7
D	1961	7	4	3	9	16	8	5	6	6	7	7	7
D	1990	7	4	3	7	12	13	5	6	6	7	7	7
D	1987	7	5	3	11	14	10	5	6	6	7	7	7
D	1988	7	5	0	3	17	16	5	6	7	7	7	7
D	1989	7	5	3	11	17	8	5	6	7	7	7	7
D	1931	7	5	4	6	16	13	6	6	6	7	7	7
D	1976	7	4	3	12	18	12	5	6	7	7	7	7
D	1977	7	5	4	11	18	15	6	6	7	7	7	7
D	1924	7	5	5	14	20	17	7	7	7	7	7	7

PEIR Hydrologic Analysis
ALAMEDA SYSTEM**Table A4.1****Estimated Average Annual FLOW IN ALAMEDA CK BELOW THE DIVERSION DAM (1) under Various Conditions (AF per year)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)**

Hydrologic Year Type	Abbrev.	Percentile	Base, Baseline Condition (2005), Calaveras Down	2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up
All	-		(a)	(b)
All	-		8,843	9,494
Wet	W	81-100%	25,331	25,731
Above Normal	AN	61-80%	13,911	12,734
Normal	N	41-60%	4,731	4,611
Below Normal	BN	21-40%	394	3,013
Dry	D	0-20%	58	1,585

(a) 265mgd Existing Setting, Calaveras and Crystal Springs Constrained

(b) 265 mgd with WSIP, Calaveras & Crystal Springs Capacity Restored, 20mgd R/C/GW, Water Transfer and Conjunctive Use

Table A4.2**Estimated Average Monthly FLOW IN ALAMEDA CK BELOW THE DIVERSION DAM (1) Under Various Conditions (AF per month)**

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Base, Baseline Condition (2005), Calaveras Down												
All	1	12	692	2,299	3,075	1,989	748	26	0	0	0	0
Wet	0	28	1,379	6,967	8,099	5,757	2,972	130	0	0	0	0
Above Normal	7	23	1,126	3,672	5,294	3,096	692	0	0	0	0	0
Normal	0	6	954	868	1,870	906	126	0	0	0	0	0
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0
Dry	0	0	0	0	57	0	0	0	0	0	0	0

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

All	9	49	686	2,080	2,945	2,323	1,004	262	105	17	8	5
Wet	7	77	1,488	6,376	8,142	5,878	3,078	415	198	42	18	12
Above Normal	18	87	973	2,559	4,077	3,429	1,116	295	139	23	11	7
Normal	7	29	687	669	1,364	1,092	391	270	87	8	5	3
Below Normal	7	36	168	561	778	862	308	216	64	6	4	3
Dry	7	16	131	300	432	377	162	114	38	3	3	2

Percent Change, Base vs 2018 ACDD Release

All	800%	308%	-1%	-10%	-4%	17%	34%	908%	*	*	*	*
Wet	*	175%	8%	-8%	1%	2%	4%	219%	*	*	*	*
Above Normal	157%	278%	-14%	-30%	-23%	11%	61%	*	*	*	*	*
Normal	*	383%	-28%	-23%	-27%	21%	210%	*	*	*	*	*
Below Normal	*	*	833%	1147%	663%	276%	*	*	*	*	*	*
Dry	*	*	*	*	658%	*	*	*	*	*	*	*

* Indicates an increase from zero release in Baseline Case. See tables above for actual increase.

Table A4.3**Estimated Monthly Statistics for FLOW IN ALAMEDA CREEK BELOW THE DIVERSION DAM (1) (AF per month)**

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Base, Baseline Condition (2005), Calaveras Down												
Average	1	12	692	2,299	3,075	1,989	748	26	0	0	0	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Median	0	0	0	0	198	0	0	0	0	0	0	0
Maximum	123	396	11,877	14,593	16,968	18,057	11,775	2,087	0	0	0	0
Std. Deviation	14	59	2,024	3,790	4,359	3,389	2,194	230	0	0	0	0

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

Average	9	49	686	2,080	2,945	2,323	1,004	262	105	17	8	5
Minimum	0	0	0	0	0	3	9	0	0	0	0	0
Median	6	15	208	640	953	806	322	242	86	9	6	3
Maximum	150	617	11,877	14,593	16,968	18,057	11,775	2,774	361	230	110	74
Std. Deviation	17	93	1,857	3,348	4,055	3,174	2,140	300	73	32	13	9

PEIR Hydrologic Analysis
ALAMEDA SYSTEM

Table A4.2b (Transposed)

Estimated Average Monthly FLOW IN ALAMEDA CK BELOW THE DIVERSION DAM (1) Under Various Conditions (CFS)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Base, Baseline Condition (2005), Calaveras Down

	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	0	0	0	0	0	0
Nov	0	0	0	0	0	0
Dec	22	18	16	0	0	11
Jan	113	60	14	1	0	37
Feb	145	94	33	2	1	55
Mar	94	50	15	4	0	32
Apr	50	12	2	0	0	13
May	2	0	0	0	0	0
June	0	0	0	0	0	0
July	0	0	0	0	0	0
Aug	0	0	0	0	0	0
Sept	0	0	0	0	0	0

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	0	0	0	0	0	0
Nov	1	1	0	1	0	1
Dec	24	16	11	3	2	11
Jan	104	42	11	9	5	34
Feb	145	73	24	14	8	53
Mar	96	56	18	14	6	38
Apr	52	19	7	5	3	17
May	7	5	4	4	2	4
June	3	2	1	1	1	2
July	1	0	0	0	0	0
Aug	0	0	0	0	0	0
Sept	0	0	0	0	0	0

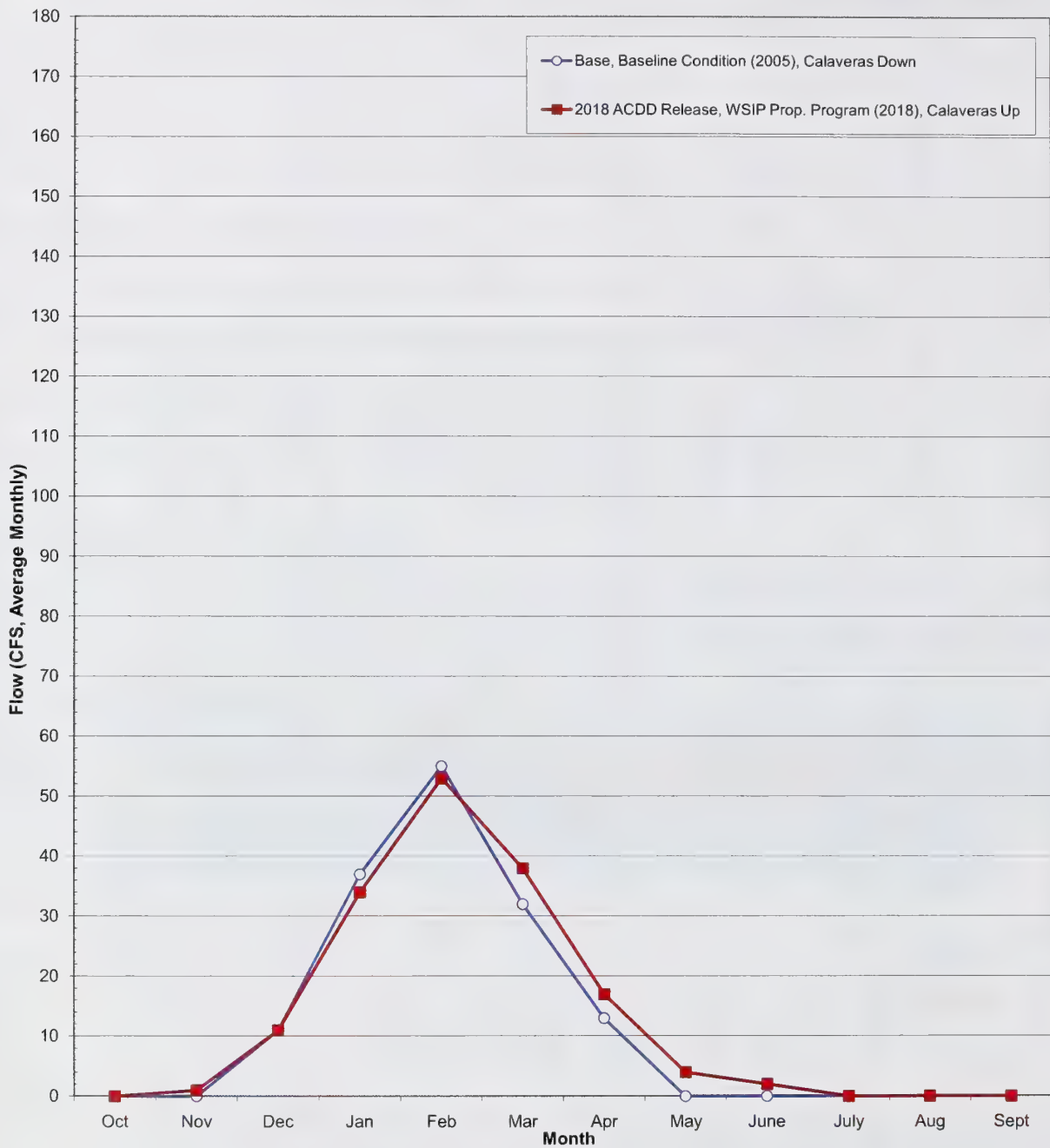
Delta and Percent Change, Base vs 2018 ACDD Release

	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]
Nov	1 *	1 *	0 [0%]	1 *	0 [0%]	1 *
Dec	2 [9%]	-2 [-11%]	-5 [-31%]	3 *	2 *	0 [0%]
Jan	-9 [-8%]	-18 [-30%]	-3 [-21%]	8 [800%]	5 *	-3 [-8%]
Feb	0 [0%]	-21 [-22%]	-9 [-27%]	12 [600%]	7 [700%]	-2 [-4%]
Mar	2 [2%]	6 [12%]	3 [20%]	10 [250%]	6 *	6 [19%]
Apr	2 [4%]	7 [58%]	5 [250%]	5 *	3 *	4 [31%]
May	5 [250%]	5 *	4 *	4 *	2 *	4 *
June	3 *	2 *	1 *	1 *	1 *	2 *
July	1 *	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]
Aug	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]
Sept	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]

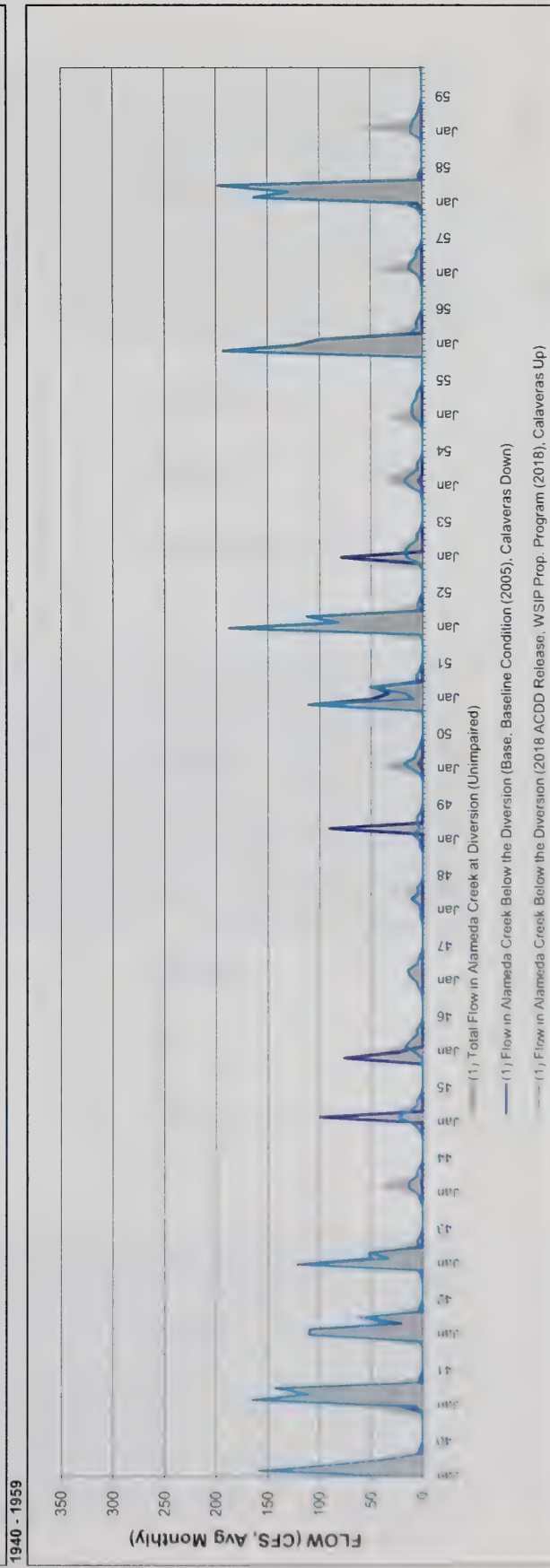
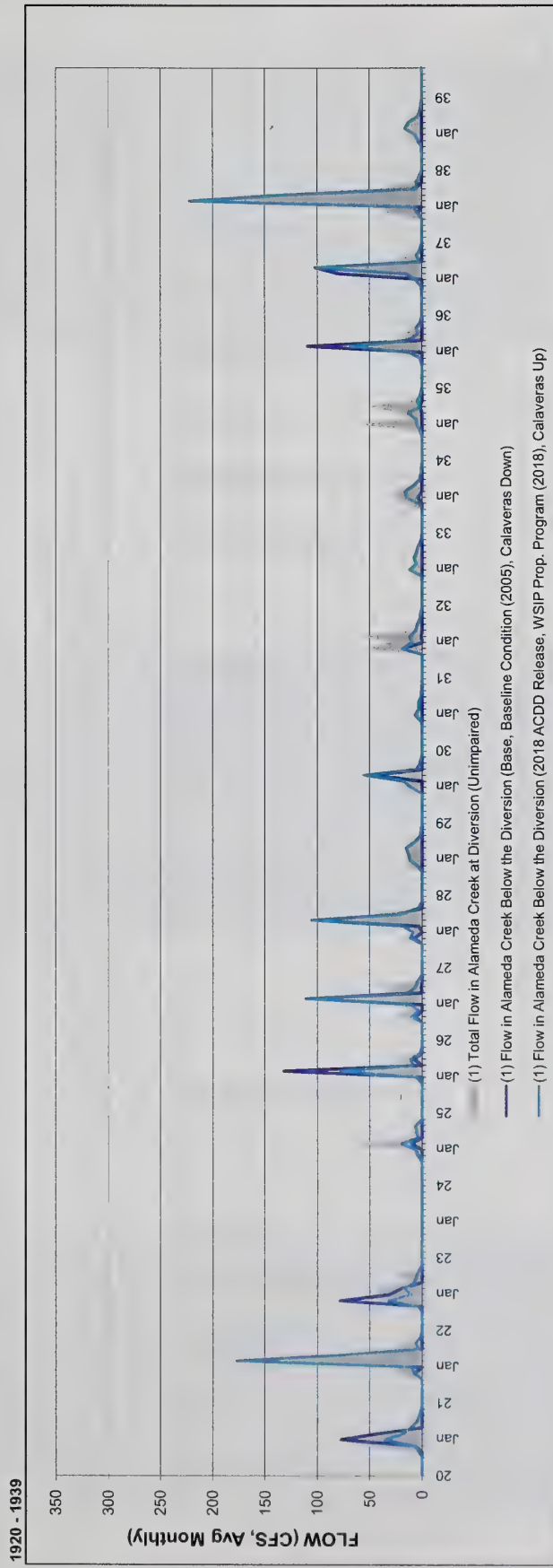
Key

	> 0%
	< 0 to -5%
	< -5%

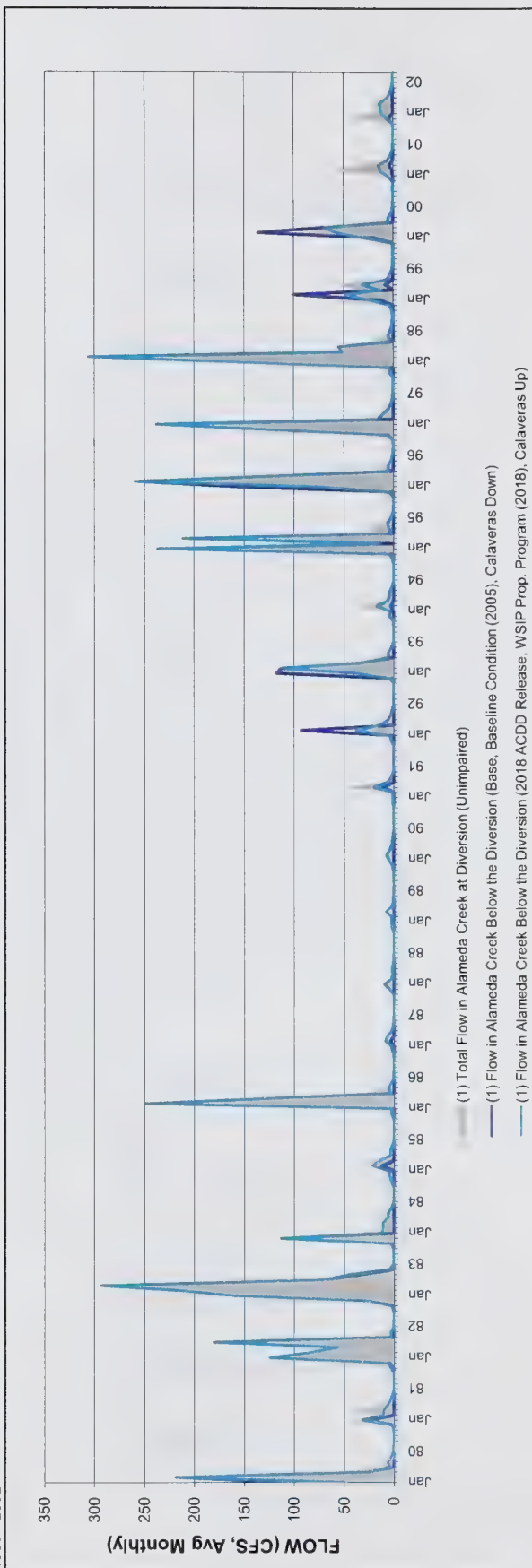
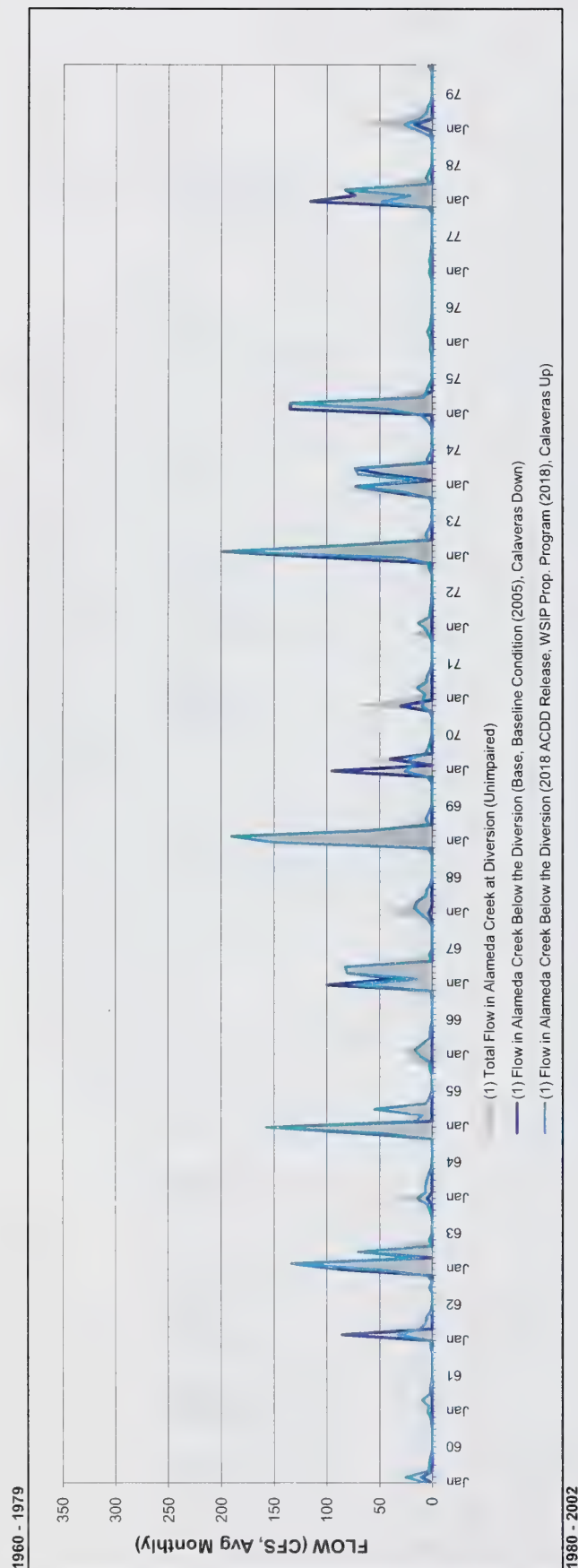
A4.4 - Average Monthly Flows FLOW IN ALAMEDA CREEK BELOW THE DIVERSION DAM (1)



A4.9 CHRONOLOGICAL ALAMEDA CREEK FLOW (1) BELOW THE DIVERSION DAM



A4.9 CHRONOLOGICAL ALAMEDA CREEK FLOW (1) BELOW THE DIVERSION DAM



A4.11 FLOW IN ALAMEDA CK BELOW THE DIVERSION DAM (1)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

(1) Flow in Alameda Creek Below the Diversion - CFS, Average Monthly

Base - Calaveras Constrained

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	0	1	25	160	210	294	70	34	0	0	0	0
W	1998	0	0	0	149	303	51	55	0	0	0	0	0
W	1958	0	0	0	5	161	130	198	0	0	0	0	0
W	1941	0	0	0	22	164	111	143	0	0	0	0	0
W	1982	0	0	5	125	83	56	180	0	0	0	0	0
W	1995	0	0	0	236	0	211	0	0	0	0	0	0
W	1956	0	0	193	124	98	0	0	0	0	0	0	0
W	1952	0	0	3	187	81	112	0	0	0	0	0	0
W	1938	0	0	4	0	221	135	9	0	0	0	0	0
W	1997	0	6	125	237	0	0	0	0	0	0	0	0
W	1969	0	0	0	152	188	60	0	0	0	0	0	0
W	1973	0	1	0	104	198	86	0	0	0	0	0	0
W	1986	0	0	0	0	247	127	0	0	0	0	0	0
W	1980	0	0	0	103	216	25	0	0	0	0	0	0
W	1942	0	0	3	110	109	21	61	0	0	0	0	0
W	1967	0	0	0	100	33	81	83	0	0	0	0	0
AN	1963	2	0	0	84	133	0	71	0	0	0	0	0
AN	1940	0	0	0	1	157	88	34	0	0	0	0	0
AN	1965	0	0	69	157	0	0	0	0	0	0	0	0
AN	1996	0	0	0	156	256	127	0	0	0	0	0	0
AN	1922	0	0	8	0	176	75	0	0	0	0	0	0
AN	1975	0	0	0	0	134	135	11	0	0	0	0	0
AN	1974	0	0	38	73	0	47	73	0	0	0	0	0
AN	1978	0	0	0	116	73	83	0	0	0	0	0	0
AN	1993	0	0	0	117	112	33	0	0	0	0	0	0
AN	1951	0	0	111	48	33	46	0	0	0	0	0	0
AN	1943	0	0	0	122	50	52	0	0	0	0	0	0
AN	1927	0	7	0	0	110	0	1	0	0	0	0	0
AN	1937	0	0	0	0	79	102	0	0	0	0	0	0
AN	2000	0	0	0	19	134	68	0	0	0	0	0	0
AN	1921	0	0	7	78	42	0	0	0	0	0	0	0
AN	1999	0	0	0	13	98	0	8	0	0	0	0	0
AN	1923	0	0	78	31	20	0	0	0	0	0	0	0
N	1953	0	0	3	79	0	0	0	0	0	0	0	0
N	1928	0	0	8	0	3	106	24	0	0	0	0	0
N	1970	0	0	0	95	0	40	0	0	0	0	0	0
N	1984	0	2	113	0	0	0	0	0	0	0	0	0
N	1946	0	0	76	25	0	0	0	0	0	0	0	0
N	1926	0	0	0	0	131	0	8	0	0	0	0	0
N	1936	0	0	0	0	108	0	0	0	0	0	0	0
N	1945	0	0	0	0	98	0	0	0	0	0	0	0
N	1971	0	0	30	0	0	0	0	0	0	0	0	0
N	1935	0	0	0	0	0	0	2	0	0	0	0	0
N	1932	0	0	19	0	1	0	0	0	0	0	0	0
N	1979	0	0	0	2	16	0	0	0	0	0	0	0
N	1962	0	0	0	0	84	0	0	0	0	0	0	0
N	1949	0	0	0	0	0	90	0	0	0	0	0	0
N	1992	0	0	0	0	92	0	0	0	0	0	0	0
N	1981	0	0	0	26	0	0	0	0	0	0	0	0
BN	2001	0	0	0	0	1	4	0	0	0	0	0	0
BN	1930	0	0	0	0	0	48	0	0	0	0	0	0
BN	1954	0	0	0	0	4	0	0	0	0	0	0	0
BN	1968	0	0	0	3	0	0	0	0	0	0	0	0
BN	1959	0	0	0	0	0	0	0	0	0	0	0	0
BN	1925	0	0	0	0	10	0	0	0	0	0	0	0
BN	1944	0	0	0	0	0	1	0	0	0	0	0	0
BN	2002	0	0	5	0	0	0	0	0	0	0	0	0
BN	1950	0	0	0	0	4	0	0	0	0	0	0	0
BN	1966	0	0	0	0	0	0	0	0	0	0	0	0
BN	1955	0	0	0	0	0	0	0	0	0	0	0	0
BN	1957	0	0	0	0	0	0	0	0	0	0	0	0
BN	1934	0	0	0	4	0	0	0	0	0	0	0	0
BN	1985	0	0	0	0	12	0	0	0	0	0	0	0
BN	1991	0	0	0	0	0	11	0	0	0	0	0	0
BN	1929	0	0	0	0	0	0	0	0	0	0	0	0
BN	1964	0	0	0	5	0	0	0	0	0	0	0	0
D	1947	0	0	0	0	0	0	0	0	0	0	0	0
D	1994	0	0	0	0	2	0	0	0	0	0	0	0
D	1939	0	0	0	0	0	0	0	0	0	0	0	0
D	1948	0	0	0	0	0	0	0	0	0	0	0	0
D	1960	0	0	0	0	10	0	0	0	0	0	0	0
D	1972	0	0	0	0	0	0	0	0	0	0	0	0
D	1933	0	0	0	0	0	0	0	0	0	0	0	0
D	1961	0	0	0	0	0	0	0	0	0	0	0	0
D	1990	0	0	0	0	0	0	0	0	0	0	0	0
D	1987	0	0	0	0	4	0	0	0	0	0	0	0
D	1988	0	0	0	0	0	0	0	0	0	0	0	0
D	1989	0	0	0	0	0	0	0	0	0	0	0	0
D	1931	0	0	0	0	0	0	0	0	0	0	0	0
D	1976	0	0	0	0	0	0	0	0	0	0	0	0
D	1977	0	0	0	0	0	0	0	0	0	0	0	0
D	1924	0	0	0	0	0	0	0	0	0	0	0	0

A4.11 FLOW IN ALAMEDA CK BELOW THE DIVERSION DAM (1)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

(1) Flow in Alameda Creek Below the Diversion - CFS, Average Monthly

2018 WSP CSRE ACDD RH DT2300

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	0	3	25	160	210	294	70	45	5	0	0	0
W	1998	0	4	3	149	303	51	55	3	5	4	2	1
W	1958	0	0	4	14	161	130	198	3	4	0	0	0
W	1941	0	0	1	6	164	111	143	3	3	0	0	0
W	1982	0	3	6	125	83	56	180	3	3	0	0	0
W	1995	0	1	5	236	16	211	3	5	6	3	1	0
W	1956	0	0	193	124	98	12	5	6	3	0	0	0
W	1952	0	0	3	187	81	112	2	5	3	0	0	0
W	1938	0	0	4	8	221	135	6	5	3	0	0	0
W	1997	0	7	125	237	16	11	6	3	1	1	0	0
W	1969	0	0	3	152	188	60	4	6	3	0	0	0
W	1973	0	1	3	28	198	86	4	6	3	0	0	0
W	1986	0	0	2	2	247	127	3	6	3	0	0	0
W	1980	0	0	3	48	216	24	4	6	3	0	0	0
W	1942	0	0	3	110	109	31	61	3	3	0	0	0
W	1967	0	0	1	72	13	81	83	1	3	0	0	0
AN	1963	2	0	4	49	133	12	71	1	3	0	0	0
AN	1940	0	0	1	5	157	88	31	5	2	0	0	0
AN	1965	0	1	50	157	16	9	55	5	3	0	0	0
AN	1996	0	0	4	72	256	127	5	5	3	1	0	0
AN	1922	0	0	8	10	176	75	4	6	2	0	0	0
AN	1975	0	0	4	10	41	135	9	5	3	0	0	0
AN	1974	0	2	26	73	13	70	73	5	4	0	0	0
AN	1978	0	0	4	48	20	83	1	5	3	0	0	0
AN	1993	0	0	4	36	112	32	5	5	2	0	0	0
AN	1951	0	0	111	9	17	51	6	6	3	0	0	0
AN	1943	0	2	4	122	33	52	4	6	2	0	0	0
AN	1927	0	10	4	10	110	13	6	4	0	0	0	0
AN	1937	0	0	1	7	15	102	2	5	2	0	0	0
AN	2000	0	1	1	30	55	68	6	5	2	1	0	0
AN	1921	0	3	7	36	18	11	5	3	1	0	0	0
AN	1999	1	1	4	23	48	13	32	5	4	1	1	0
AN	1923	0	4	32	10	17	8	6	3	0	0	0	0
N	1953	0	0	3	15	17	13	6	5	2	0	0	0
N	1928	0	0	11	9	18	106	21	4	0	0	0	0
N	1970	0	0	4	26	17	21	6	4	2	0	0	0
N	1984	0	3	113	12	11	11	6	6	2	0	0	0
N	1946	0	1	0	7	17	12	5	6	2	0	0	0
N	1926	0	0	0	7	78	9	11	2	0	0	0	0
N	1936	0	0	2	12	68	14	4	6	2	0	0	0
N	1945	0	0	4	10	24	13	5	5	2	0	0	0
N	1971	0	2	9	9	7	14	5	5	2	0	0	0
N	1935	0	0	2	5	6	14	2	5	2	0	0	0
N	1932	0	0	19	10	12	6	5	2	1	0	0	0
N	1979	0	0	1	13	26	12	5	4	1	0	0	0
N	1962	0	0	1	2	32	12	6	5	1	0	0	0
N	1949	0	0	3	3	9	3	5	6	2	0	0	0
N	1992	0	0	3	4	38	14	6	3	1	0	0	0
N	1981	0	0	2	31	11	10	6	3	1	0	0	0
BN	2001	0	0	1	6	13	15	6	3	1	0	0	0
BN	1930	0	0	1	11	17	55	5	2	1	0	0	0
BN	1954	0	1	2	11	18	13	5	5	2	0	0	0
BN	1968	0	0	4	11	17	14	6	5	1	0	0	0
BN	1959	0	0	2	11	10	9	5	3	1	0	0	0
BN	1925	0	0	4	6	19	4	5	6	0	0	0	0
BN	1944	0	0	3	5	13	13	6	5	1	0	0	0
BN	2002	0	1	6	11	12	13	6	3	1	0	0	0
BN	1950	0	0	2	9	18	8	6	3	1	0	0	0
BN	1966	0	2	2	11	16	10	2	2	1	0	0	0
BN	1955	0	0	2	9	10	10	6	5	1	0	0	0
BN	1957	0	0	2	5	13	11	6	5	1	0	0	0
BN	1934	0	0	3	15	16	8	2	1	1	0	0	0
BN	1985	0	3	4	5	21	14	4	3	2	0	0	0
BN	1991	0	0	1	1	1	20	6	2	1	0	0	0
BN	1929	0	0	4	12	13	16	7	2	1	0	0	0
BN	1964	0	2	5	14	6	6	5	3	1	0	0	0
D	1947	0	1	4	6	13	15	5	4	1	0	0	0
D	1994	0	0	4	3	17	6	4	4	1	0	0	0
D	1939	0	1	4	7	16	13	4	2	1	0	0	0
D	1948	0	0	2	2	3	11	4	5	1	0	0	0
D	1960	0	0	1	6	25	4	3	2	1	0	0	0
D	1972	0	0	3	6	13	3	2	1	1	0	0	0
D	1933	0	0	1	12	6	8	5	3	1	0	0	0
D	1961	0	0	2	4	3	10	2	2	1	0	0	0
D	1990	0	1	2	6	7	4	2	1	1	0	0	0
D	1987	0	0	1	2	8	7	2	1	1	0	0	0
D	1988	0	0	4	9	2	2	2	1	0	0	0	0
D	1989	0	0	2	2	2	8	2	1	0	0	0	0
D	1931	0	0	1	7	3	4	1	1	1	0	0	0
D	1976	0	0	2	2	2	4	2	1	0	0	0	0
D	1977	0	0	1	3	1	2	1	1	0	0	0	0
D	1924	0	0	0	0	0	0	0	0	0	0	0	0

A4.11 FLOW IN ALAMEDA CK BELOW THE DIVERSION DAM (1)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)**(1) Flow in Alameda Creek Below the Diversion - CFS, Average Monthly**

2018 WSIP CSRE ACDD RH DT2300 minus

Base - Calaveras Constrained

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	0	2	0	0	0	0	0	11	5	0	0	0
W	1998	0	4	3	0	0	0	0	3	5	4	2	1
W	1958	0	0	4	9	0	0	0	3	4	0	0	0
W	1941	0	0	1	-16	0	0	0	3	3	0	0	0
W	1982	0	3	2	0	0	0	0	3	3	0	0	0
W	1995	0	1	5	0	16	0	2	5	6	3	1	0
W	1956	0	0	0	0	0	12	5	6	3	0	0	0
W	1952	0	0	0	0	0	0	2	5	3	0	0	0
W	1938	0	0	0	8	0	0	-3	5	3	0	0	0
W	1997	0	1	0	0	16	11	6	3	1	1	0	0
W	1969	0	0	3	0	0	0	4	6	3	0	0	0
W	1973	0	1	3	-76	0	0	4	6	3	0	0	0
W	1986	0	0	2	2	0	0	3	6	3	0	0	0
W	1980	0	0	3	-55	0	-2	4	6	3	0	0	0
W	1942	0	0	0	0	0	11	0	3	3	0	0	0
W	1967	0	0	1	-27	-20	0	0	1	3	0	0	0
AN	1963	0	0	4	-35	0	12	0	1	3	0	0	0
AN	1940	0	0	1	5	0	0	-3	5	2	0	0	0
AN	1965	0	1	-19	0	16	9	55	5	3	0	0	0
AN	1996	0	0	4	-84	0	0	5	5	3	1	0	0
AN	1922	0	0	0	10	0	0	4	6	2	0	0	0
AN	1975	0	0	4	10	-92	0	-3	5	3	0	0	0
AN	1974	0	2	-13	0	13	23	0	5	4	0	0	0
AN	1978	0	0	4	-68	-52	0	1	5	3	0	0	0
AN	1993	0	0	4	-81	0	-2	5	5	2	0	0	0
AN	1951	0	0	0	-39	-15	5	6	6	3	0	0	0
AN	1943	0	2	4	0	-17	0	4	6	2	0	0	0
AN	1927	0	4	4	10	0	13	5	4	0	0	0	0
AN	1937	0	0	1	7	-64	0	2	5	2	0	0	0
AN	2000	0	1	1	11	-79	0	6	4	2	1	0	0
AN	1921	0	3	0	-42	-24	11	5	3	1	0	0	0
AN	1999	1	1	4	10	-50	13	23	5	4	1	1	0
AN	1923	0	4	-46	-21	-3	8	6	3	0	0	0	0
N	1953	0	0	0	-63	17	13	6	5	2	0	0	0
N	1928	0	0	3	9	15	0	-3	4	0	0	0	0
N	1970	0	0	4	-69	17	-18	6	4	2	0	0	0
N	1984	0	1	0	12	11	11	6	6	2	0	0	0
N	1946	0	1	-76	-17	17	12	5	6	2	0	0	0
N	1926	0	0	0	7	-53	9	3	2	0	0	0	0
N	1936	0	0	2	12	-40	14	4	6	2	0	0	0
N	1945	0	0	4	10	-75	13	5	5	2	0	0	0
N	1971	0	2	-20	9	7	14	5	5	2	0	0	0
N	1935	0	0	2	5	6	14	0	5	2	0	0	0
N	1932	0	0	0	10	11	6	5	2	1	0	0	0
N	1979	0	0	1	11	9	12	5	4	1	0	0	0
N	1962	0	0	1	2	-52	12	6	5	1	0	0	0
N	1949	0	0	3	3	9	-87	5	6	2	0	0	0
N	1992	0	0	3	4	-54	14	6	3	1	0	0	0
N	1981	0	0	2	6	11	10	6	3	1	0	0	0
BN	2001	0	0	1	6	12	11	6	3	1	0	0	0
BN	1930	0	0	1	11	17	7	5	2	1	0	0	0
BN	1954	0	1	2	11	14	13	5	5	2	0	0	0
BN	1968	0	0	4	8	17	14	6	5	1	0	0	0
BN	1959	0	0	2	11	10	9	5	3	1	0	0	0
BN	1925	0	0	4	6	9	4	5	6	0	0	0	0
BN	1944	0	0	3	5	13	12	6	5	1	0	0	0
BN	2002	0	1	1	11	12	13	6	3	1	0	0	0
BN	1950	0	0	2	9	14	8	6	3	1	0	0	0
BN	1966	0	2	2	11	16	10	2	2	1	0	0	0
BN	1955	0	0	2	9	10	10	6	5	1	0	0	0
BN	1957	0	0	2	5	13	11	6	5	1	0	0	0
BN	1934	0	0	3	10	16	8	2	1	1	0	0	0
BN	1985	0	3	4	5	9	14	4	3	2	0	0	0
BN	1991	0	0	1	1	1	9	6	2	1	0	0	0
BN	1929	0	0	4	12	13	16	7	2	1	0	0	0
BN	1964	0	2	5	9	6	6	5	3	1	0	0	0
D	1947	0	1	4	6	13	15	5	4	1	0	0	0
D	1994	0	0	4	3	15	6	4	4	1	0	0	0
D	1939	0	1	4	7	16	13	4	2	1	0	0	0
D	1948	0	0	2	2	3	11	4	5	1	0	0	0
D	1960	0	0	1	8	15	4	3	2	1	0	0	0
D	1972	0	0	3	6	13	3	2	1	1	0	0	0
D	1933	0	0	1	12	6	8	5	3	1	0	0	0
D	1961	0	0	2	4	3	10	2	8	1	0	0	0
D	1990	0	1	2	6	7	4	2	1	1	0	0	0
D	1987	0	0	1	2	4	7	2	1	1	0	0	0
D	1988	0	0	4	9	2	2	2	1	0	0	0	0
D	1989	0	0	2	2	2	8	2	1	0	0	0	0
D	1931	0	0	1	7	3	4	1	1	1	0	0	0
D	1976	0	0	2	2	2	4	2	1	0	0	0	0
D	1977	0	0	1	3	1	2	1	1	0	0	0	0
D	1924	0	0	0	0	0	0	0	0	0	0	0	0

Table A5.1

Estimated Average Annual FLOW IN ALAMEDA CREEK BELOW CALAVERAS CONFLUENCE (2) under Various Conditions (AF per year)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Hydrologic Year Type	Abbrev.	Percentile	Base, Baseline Condition (2005), Calaveras Down	2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up
			(a)	(b)
All	-		22,010	22,680
Wet	W	81-100%	72,361	67,329
Above Normal	AN	61-80%	29,007	24,258
Normal	N	41-60%	8,022	8,995
Below Normal	BN	21-40%	1,195	7,018
Dry	D	0-20%	328	6,681

(a) 265mgd Existing Setting, Calaveras and Crystal Springs Constrained

(b)

Table A5.2

Estimated Average Monthly FLOW IN ALAMEDA CREEK BELOW CALAVERAS CONFLUENCE (2) Under Various Conditions (AF per month)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Base, Baseline Condition (2005), Calaveras Down												
All	3	41	1,292	5,161	8,250	5,077	2,060	106	14	4	1	1
Wet	1	80	3,465	17,243	25,909	16,711	8,598	307	30	12	4	2
Above Normal	12	68	1,554	7,035	11,987	6,754	1,462	103	22	6	2	1
Normal	1	29	1,397	1,501	3,154	1,586	284	60	9	2	0	0
Below Normal	1	22	78	186	338	450	72	41	7	0	0	0
Dry	1	6	26	35	124	69	43	23	1	0	0	0
2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up												
All	432	310	1,128	3,745	7,148	5,394	2,366	465	416	430	430	417
Wet	430	325	2,783	12,365	23,847	16,623	8,658	606	416	430	430	417
Above Normal	438	326	1,259	3,707	7,904	6,614	1,885	431	417	430	430	417
Normal	430	304	1,006	1,103	1,933	1,540	556	430	416	430	430	417
Below Normal	430	297	325	888	1,213	1,300	440	430	417	431	430	417
Dry	430	297	308	843	1,168	1,071	441	431	416	430	430	417

Percent Change, Base vs 2018 ACDD Release

All	14300%	656%	-13%	-27%	-13%	6%	15%	339%	2871%	10650%	42900%	41600%
Wet	42900%	306%	-20%	-28%	-8%	-1%	1%	97%	1287%	3483%	10650%	20750%
Above Normal	3550%	379%	-19%	-47%	-34%	-2%	29%	318%	1795%	7067%	21400%	41600%
Normal	42900%	948%	-28%	-27%	-39%	-3%	96%	617%	4522%	21400%	*	*
Below Normal	42900%	1250%	317%	377%	259%	189%	511%	949%	5857%	*	*	*
Dry	42900%	4850%	1085%	2309%	842%	1452%	926%	1774%	41500%	*	*	*

* Indicates an increase from zero release in Baseline Case. See tables above for actual increase.

Table A5.3

Estimated Monthly Statistics for FLOW IN ALAMEDA CREEK BELOW CALAVERAS CONFLUENCE (2) (AF per month)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Base, Baseline Condition (2005), Calaveras Down												
Average	3	41	1,292	5,161	8,250	5,077	2,060	106	14	4	1	1
Minimum	0	0	0	0	0	0	1	0	0	0	0	0
Median	0	5	38	249	516	266	113	58	10	1	0	0
Maximum	173	609	33,822	51,093	69,954	65,779	40,392	2,551	97	46	20	11
Std. Deviation	19	106	4,487	9,864	13,870	10,461	6,777	283	15	7	3	2
2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up												
Average	432	310	1,128	3,745	7,148	5,394	2,366	465	416	430	430	417
Minimum	424	296	306	841	1,109	1,070	439	429	415	427	429	415
Median	430	298	308	844	1,235	1,072	441	431	417	430	430	417
Maximum	555	692	26,543	51,046	69,266	65,677	40,236	3,238	418	431	431	417
Std. Deviation	14	60	3,306	7,569	12,420	10,020	6,665	310	1	1	1	0

Table A5.2b (Transposed)

Estimated Average Monthly FLOW IN ALAMEDA CK BELOW CALAVERAS CONFLUENCE (2) Under Various Conditions (CFS)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Base, Baseline Condition (2005), Calaveras Down

	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	0	0	0	0	0	0
Nov	1	1	0	0	0	1
Dec	56	25	23	1	0	21
Jan	280	114	24	3	1	84
Feb	462	214	56	6	2	147
Mar	272	110	26	7	1	83
Apr	144	25	5	1	1	35
May	5	2	1	1	0	2
June	1	0	0	0	0	0
July	0	0	0	0	0	0
Aug	0	0	0	0	0	0
Sept	0	0	0	0	0	0

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	7	7	7	7	7	7
Nov	5	5	5	5	5	5
Dec	45	20	16	5	5	18
Jan	201	60	18	14	14	61
Feb	426	141	34	22	21	128
Mar	270	108	25	21	17	88
Apr	146	32	9	7	7	40
May	10	7	7	7	7	8
June	7	7	7	7	7	7
July	7	7	7	7	7	7
Aug	7	7	7	7	7	7
Sept	7	7	7	7	7	7

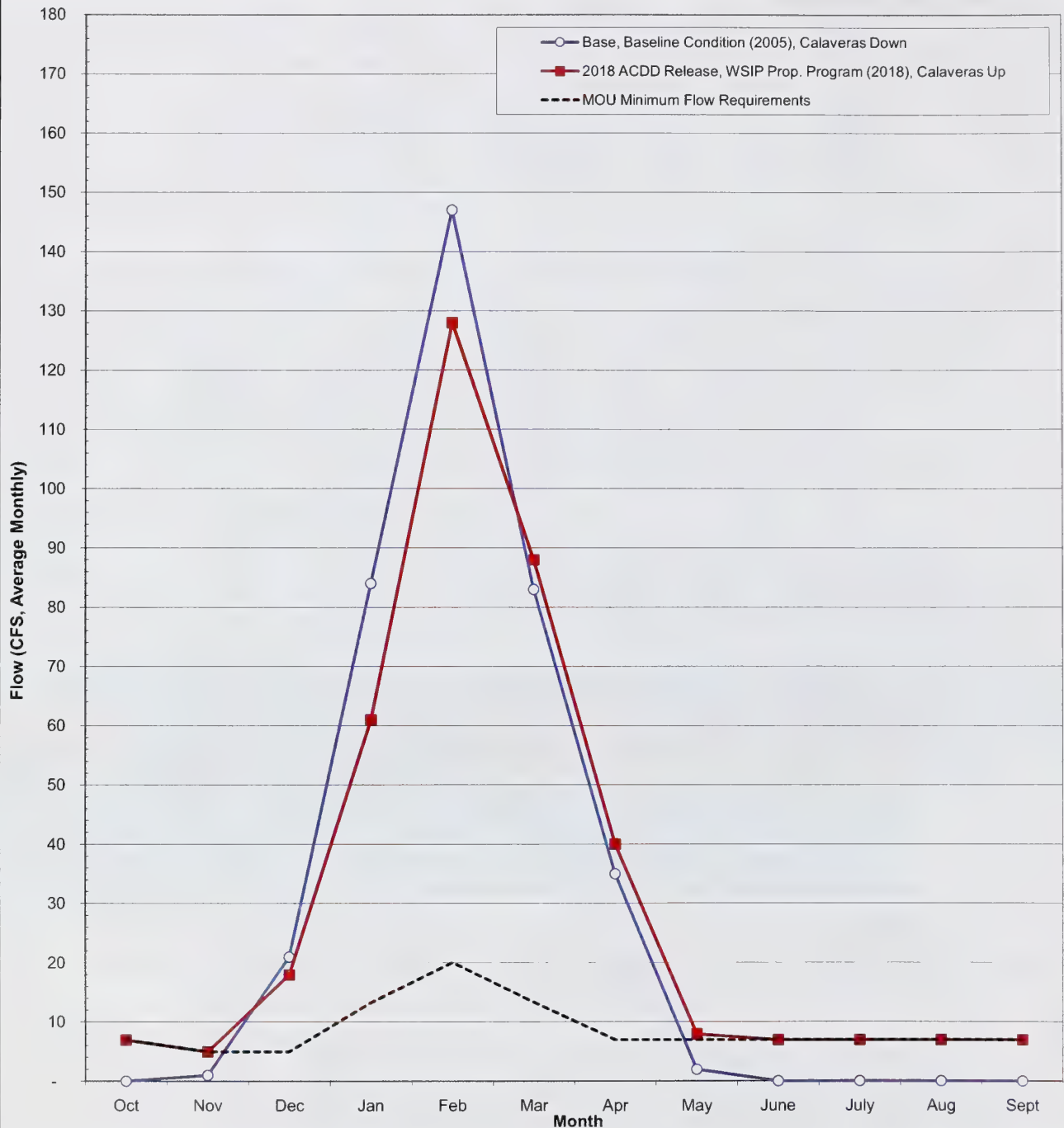
Delta and Percent Change, Base vs 2018 ACDD Release

	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	7 *	7 *	7 *	7 *	7 *	7 *
Nov	4 [400%]	4 [400%]	5 *	5 *	5 *	4 [400%]
Dec	-11 [- 20%]	-5 [- 20%]	-7 [- 30%]	4 [400%]	5 *	-3 [- 14%]
Jan	-79 [- 28%]	-54 [- 47%]	-6 [- 25%]	11 [367%]	13 [1,300%]	-23 [- 27%]
Feb	-36 [- 8%]	-73 [- 34%]	-22 [- 39%]	16 [267%]	19 [950%]	-19 [- 13%]
Mar	-2 [- 1%]	-2 [- 2%]	-1 [- 4%]	14 [200%]	16 [1,600%]	5 [6%]
Apr	2 [1%]	7 [28%]	4 [80%]	6 [600%]	8 [600%]	5 [14%]
May	5 [100%]	5 [250%]	6 [600%]	6 [600%]	7 *	6 [300%]
June	6 [600%]	7 *	7 *	7 *	7 *	7 *
July	7 *	7 *	7 *	7 *	7 *	7 *
Aug	7 *	7 *	7 *	7 *	7 *	7 *
Sept	7 *	7 *	7 *	7 *	7 *	7 *

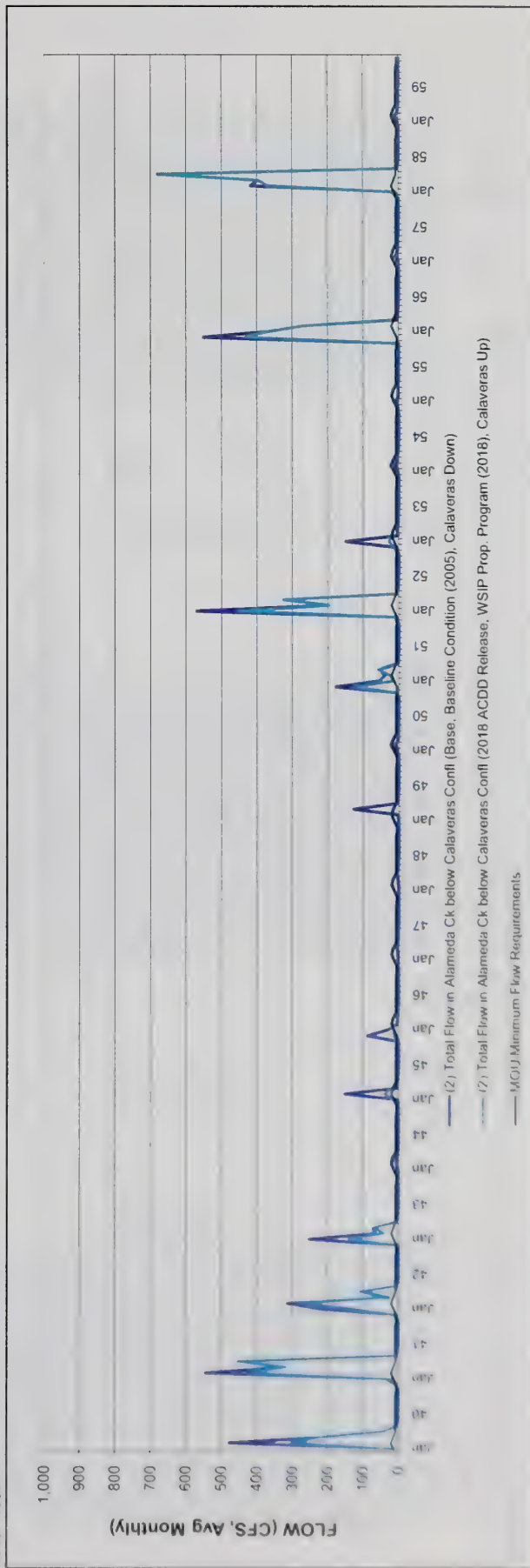
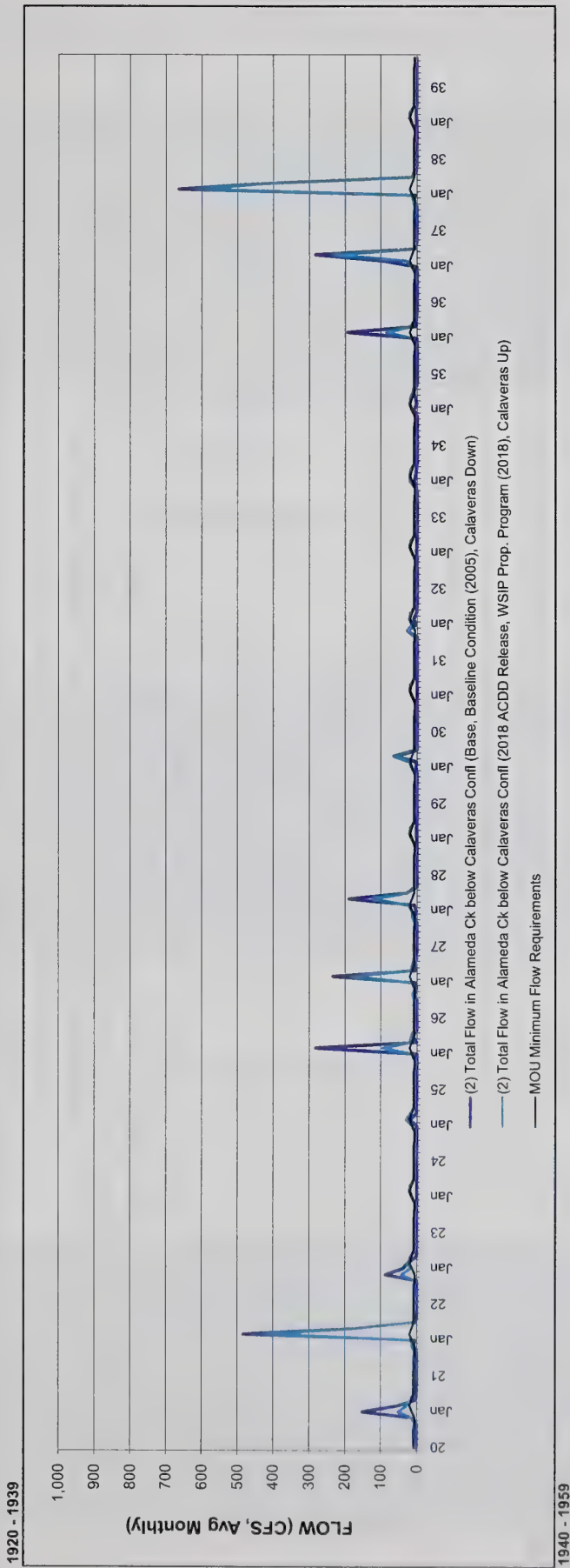
Key

	> 0%
	< 0 to -5%
	< -5%

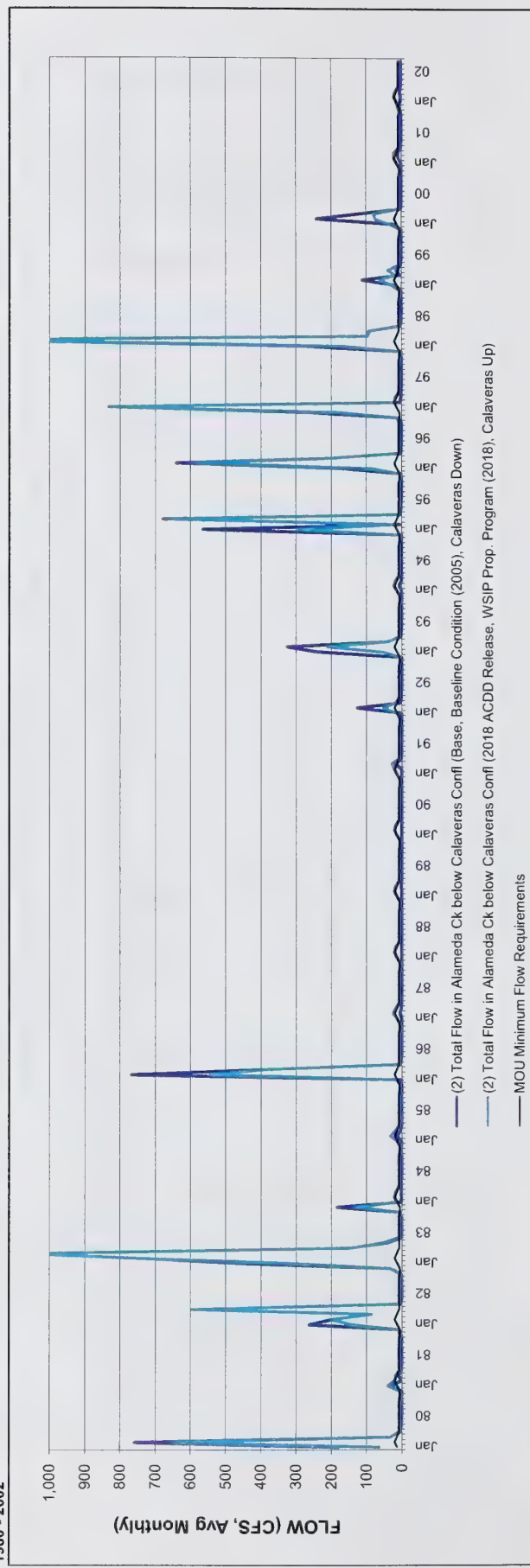
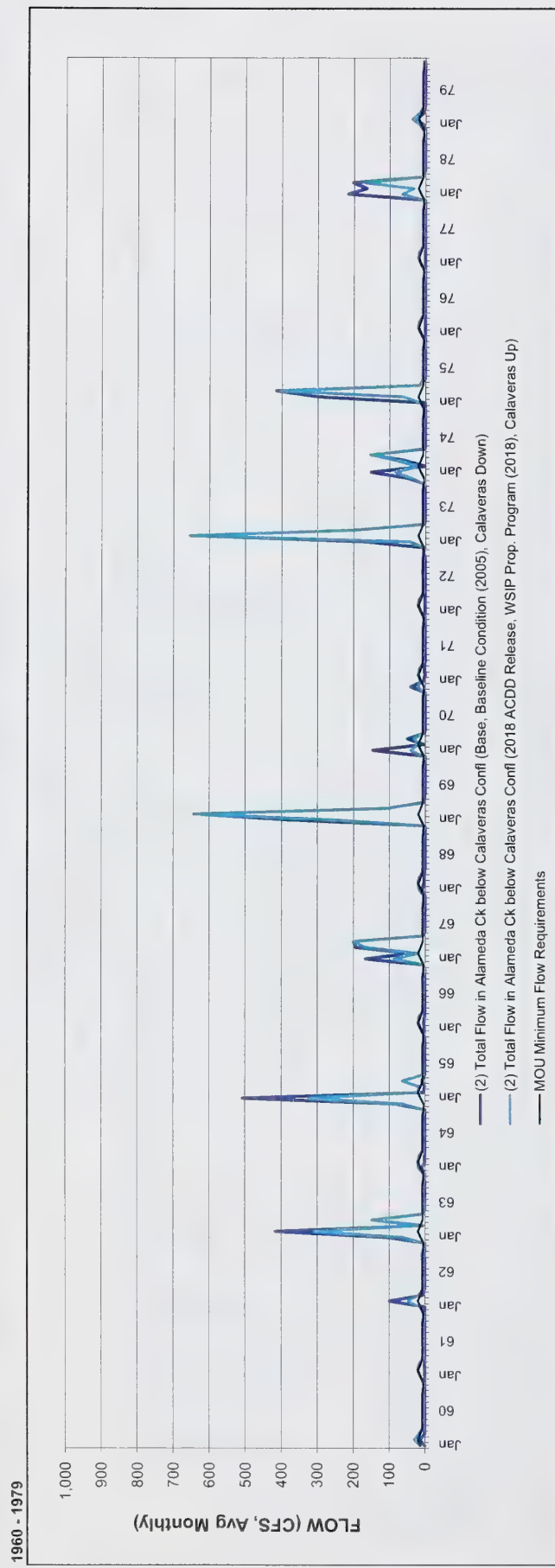
A5.4 - Average Monthly Flows FLOW IN ALAMEDA CREEK BELOW CALAVERAS CONFLUENCE (2)



A5.9 CHRONOLOGICAL ALAMEDA CREEK FLOW (2) BELOW THE CALAVERAS CONFLUENCE



A5.9 CHRONOLOGICAL ALAMEDA CREEK FLOW (2) BELOW THE CALAVERAS CONFLUENCE



A5.11 FLOW IN ALAMEDA CK BELOW THE CALAVERAS CK CONFLUENCE (2)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

(2) Total Flow in Alameda Ck below Calaveras Confl - CFS, Average Monthly

Base - Calaveras Constrained

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	0	3	33	443	721	1,070	146	41	1	0	0	0
W	1998	0	1	2	283	1,248	99	92	4	2	1	0	0
W	1958	0	0	1	9	413	397	679	4	0	0	0	0
W	1941	0	0	4	33	538	319	452	4	0	0	0	0
W	1982	0	2	8	264	199	87	595	4	0	0	0	0
W	1995	0	0	0	565	4	678	5	2	1	0	0	0
W	1956	0	0	550	372	266	5	2	1	0	0	0	0
W	1952	0	0	10	569	197	325	5	2	0	0	0	0
W	1938	0	0	9	5	657	418	15	2	0	0	0	0
W	1997	0	10	266	831	4	2	1	1	0	0	0	0
W	1969	0	0	2	382	638	108	4	1	0	0	0	0
W	1973	0	5	2	168	650	202	3	1	0	0	0	0
W	1986	0	0	0	0	761	387	4	1	0	0	0	0
W	1980	0	0	2	179	752	32	3	1	0	0	0	0
W	1942	0	0	9	217	310	27	106	4	0	0	0	0
W	1967	0	0	4	167	40	193	199	6	0	0	0	0
AN	1963	3	0	1	106	412	6	146	6	0	0	0	0
AN	1940	0	0	0	10	472	224	41	2	0	0	0	0
AN	1965	0	0	82	508	4	2	9	2	0	0	0	0
AN	1996	0	0	1	168	635	212	2	2	1	0	0	0
AN	1922	0	0	13	4	479	168	4	1	0	0	0	0
AN	1975	0	0	1	1	295	414	18	2	0	0	0	0
AN	1974	0	3	50	151	1	58	152	2	1	0	0	0
AN	1978	0	0	1	215	163	202	6	2	0	0	0	0
AN	1993	0	0	1	240	323	41	3	2	0	0	0	0
AN	1951	0	7	177	55	39	54	2	2	0	0	0	0
AN	1943	0	1	1	253	64	71	3	2	0	0	0	0
AN	1927	0	8	1	3	232	4	6	1	1	0	0	0
AN	1937	0	0	0	1	92	283	5	2	0	0	0	0
AN	2000	0	0	0	22	240	120	2	1	0	0	0	0
AN	1921	0	0	13	152	51	3	2	1	0	0	0	0
AN	1999	0	0	1	18	111	5	15	2	1	0	0	0
AN	1923	0	0	88	38	25	1	2	0	0	0	0	0
N	1953	0	0	12	149	2	4	2	2	0	0	0	0
N	1928	0	0	9	2	7	189	30	0	0	0	0	0
N	1970	0	0	1	146	3	49	1	1	0	0	0	0
N	1984	0	5	184	2	1	2	2	1	0	0	0	0
N	1946	0	0	88	31	3	2	2	1	0	0	0	0
N	1926	0	0	0	0	279	1	13	0	0	0	0	0
N	1936	0	0	0	2	191	3	3	1	0	0	0	0
N	1945	0	0	0	1	150	5	2	2	0	0	0	0
N	1971	0	1	40	5	1	3	2	1	0	0	0	0
N	1935	0	0	0	8	1	4	11	2	0	0	0	0
N	1932	0	0	27	4	9	1	1	0	0	0	0	0
N	1979	0	0	0	5	27	6	2	1	0	0	0	0
N	1962	0	0	0	0	98	6	1	1	0	0	0	0
N	1949	0	0	0	0	1	127	2	1	0	0	0	0
N	1992	0	0	0	0	125	4	2	1	0	0	0	0
N	1981	0	0	0	33	1	8	2	1	0	0	0	0
BN	2001	0	0	0	1	9	10	2	1	0	0	0	0
BN	1930	0	0	0	3	2	58	1	1	0	0	0	0
BN	1954	0	0	0	2	9	5	2	1	0	0	0	0
BN	1968	0	0	0	10	3	3	2	1	0	0	0	0
BN	1959	0	0	0	3	10	2	1	1	0	0	0	0
BN	1925	0	0	1	0	20	1	2	1	0	0	0	0
BN	1944	0	0	0	1	6	7	2	1	0	0	0	0
BN	2002	0	0	9	2	1	4	1	1	0	0	0	0
BN	1950	0	0	0	5	10	2	1	1	0	0	0	0
BN	1966	0	1	3	2	4	2	0	0	0	0	0	0
BN	1955	0	0	3	4	1	2	1	1	0	0	0	0
BN	1957	0	0	0	1	7	2	1	2	0	0	0	0
BN	1934	0	0	2	8	4	2	0	0	0	0	0	0
BN	1985	0	2	1	0	14	3	1	1	0	0	0	0
BN	1991	0	0	0	0	0	19	1	0	0	0	0	0
BN	1929	0	0	1	1	1	2	0	0	0	0	0	0
BN	1964	0	1	0	9	1	1	1	1	0	0	0	0
D	1947	0	1	1	1	1	3	2	1	0	0	0	0
D	1994	0	0	1	0	8	1	1	1	0	0	0	0
D	1939	0	0	1	1	2	2	1	0	0	0	0	0
D	1948	0	0	0	0	0	2	3	2	0	0	0	0
D	1960	0	0	0	1	15	1	1	0	0	0	0	0
D	1972	0	0	2	1	2	0	0	0	0	0	0	0
D	1933	0	0	0	2	1	1	1	1	0	0	0	0
D	1961	0	0	0	0	0	2	0	0	0	0	0	0
D	1990	0	0	0	1	1	1	0	0	0	0	0	0
D	1987	0	0	0	0	5	1	0	0	0	0	0	0
D	1988	0	0	1	1	0	0	0	0	0	0	0	0
D	1989	0	0	0	0	0	1	0	0	0	0	0	0
D	1931	0	0	0	1	0	1	0	0	0	0	0	0
D	1976	0	0	0	0	0	1	0	0	0	0	0	0
D	1977	0	0	0	0	0	0	0	0	0	0	0	0
D	1924	0	0	0	0	0	0	0	0	0	0	0	0

A5.11 FLOW IN ALAMEDA CK BELOW THE CALAVERAS CK CONFLUENCE (2)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

(2) Total Flow in Alameda Ck below Calaveras Confl - CFS, Average Monthly

2018 WSIP CSRE ACDD RH DT2300

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	7	6	33	322	720	1,068	144	53	7	7	7	7
W	1998	7	5	5	166	1,236	97	90	7	7	7	7	7
W	1958	7	5	5	19	363	396	676	7	7	7	7	7
W	1941	7	5	5	17	423	317	449	7	7	7	7	7
W	1982	7	5	10	143	198	85	593	7	7	7	7	7
W	1995	7	5	5	293	20	661	7	7	7	7	7	7
W	1956	7	5	432	371	265	17	7	7	7	7	7	7
W	1952	7	5	10	448	195	323	7	7	7	7	7	7
W	1938	7	5	9	14	606	417	12	7	7	7	7	7
W	1997	7	11	176	830	20	17	7	7	7	7	7	7
W	1969	7	5	5	262	637	106	7	7	7	7	7	7
W	1973	7	6	5	43	649	200	7	7	7	7	7	7
W	1986	7	5	5	14	537	385	7	7	7	7	7	7
W	1980	7	5	5	63	645	31	7	7	7	7	7	7
W	1942	7	5	9	126	275	38	108	7	7	7	7	7
W	1967	7	5	5	87	20	167	197	7	7	7	7	7
AN	1963	9	5	5	62	305	17	149	7	7	7	7	7
AN	1940	7	5	5	15	298	223	38	7	7	7	7	7
AN	1965	7	5	63	323	20	17	64	7	7	7	7	7
AN	1996	7	5	5	84	583	210	7	7	7	7	7	7
AN	1922	7	5	13	14	418	166	7	7	7	7	7	7
AN	1975	7	5	5	14	61	400	15	7	7	7	7	7
AN	1974	7	5	37	84	20	81	149	7	7	7	7	7
AN	1978	7	5	5	65	32	169	7	7	7	7	7	7
AN	1993	7	5	5	53	208	39	7	7	7	7	7	7
AN	1951	7	7	126	16	24	59	7	7	7	7	7	7
AN	1943	7	5	5	140	40	70	7	7	7	7	7	7
AN	1927	7	12	5	14	182	17	11	7	7	7	7	7
AN	1937	7	5	5	14	28	229	7	7	7	7	7	7
AN	2000	7	5	5	33	72	78	7	7	7	7	7	7
AN	1921	7	5	13	52	27	17	7	7	7	7	7	7
AN	1999	7	5	5	27	60	17	39	7	7	7	7	7
AN	1923	7	5	41	17	22	17	7	7	7	7	7	7
N	1953	7	5	12	28	20	17	7	7	7	7	7	7
N	1928	7	5	13	14	23	126	27	7	7	7	7	7
N	1970	7	5	5	40	20	31	7	7	7	7	7	7
N	1984	7	7	128	14	20	17	7	7	7	7	7	7
N	1946	7	5	12	14	20	17	7	7	7	7	7	7
N	1926	7	5	5	14	93	17	16	7	7	7	7	7
N	1936	7	5	5	14	84	17	7	7	7	7	7	7
N	1945	7	5	5	14	39	17	7	7	7	7	7	7
N	1971	7	5	20	14	20	17	7	7	7	7	7	7
N	1935	7	5	5	14	20	17	11	7	7	7	7	7
N	1932	7	5	27	14	21	17	7	7	7	7	7	7
N	1979	7	5	5	16	36	17	7	7	7	7	7	7
N	1962	7	5	5	14	46	17	7	7	7	7	7	7
N	1949	7	5	5	14	20	18	7	7	7	7	7	7
N	1992	7	5	5	14	52	17	7	7	7	7	7	7
N	1981	7	5	5	39	20	17	7	7	7	7	7	7
BN	2001	7	5	5	14	21	21	7	7	7	7	7	7
BN	1930	7	5	5	14	20	65	7	7	7	7	7	7
BN	1954	7	5	5	14	24	17	7	7	7	7	7	7
BN	1968	7	5	5	17	20	17	7	7	7	7	7	7
BN	1959	7	5	5	14	20	17	7	7	7	7	7	7
BN	1925	7	5	5	14	30	17	7	7	7	7	7	7
BN	1944	7	5	5	14	20	19	7	7	7	7	7	7
BN	2002	7	5	10	14	20	17	7	7	7	7	7	7
BN	1950	7	5	5	14	24	17	7	7	7	7	7	7
BN	1966	7	5	5	14	20	17	7	7	7	7	7	7
BN	1955	7	5	5	14	20	17	7	7	7	7	7	7
BN	1957	7	5	5	14	20	17	7	7	7	7	7	7
BN	1934	7	5	5	18	20	17	7	7	7	7	7	7
BN	1985	7	5	5	14	32	17	7	7	7	7	7	7
BN	1991	7	5	5	14	20	28	7	7	7	7	7	7
BN	1929	7	5	5	14	20	17	7	7	7	7	7	7
BN	1964	7	5	5	18	20	17	7	7	7	7	7	7
D	1947	7	5	5	14	20	17	7	7	7	7	7	7
D	1994	7	5	5	14	22	17	7	7	7	7	7	7
D	1939	7	5	5	14	20	17	7	7	7	7	7	7
D	1948	7	5	5	14	20	17	7	7	7	7	7	7
D	1960	7	5	5	14	30	17	7	7	7	7	7	7
D	1972	7	5	5	14	20	17	7	7	7	7	7	7
D	1933	7	5	5	14	20	17	7	7	7	7	7	7
D	1961	7	5	5	14	20	17	7	7	7	7	7	7
D	1990	7	5	5	14	20	17	7	7	7	7	7	7
D	1987	7	5	5	14	24	17	7	7	7	7	7	7
D	1988	7	5	5	14	20	17	7	7	7	7	7	7
D	1989	7	5	5	14	20	17	7	7	7	7	7	7
D	1931	7	5	5	14	20	17	7	7	7	7	7	7
D	1976	7	5	5	14	20	17	7	7	7	7	7	7
D	1977	7	5	5	14	20	17	7	7	7	7	7	7
D	1924	7	5	5	14	20	17	7	7	7	7	7	7

A5.11 FLOW IN ALAMEDA CK BELOW THE CALAVERAS CK CONFLUENCE (2)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)**(2) Total Flow in Alameda Ck below Calaveras Confl - CFS, Average Monthly**

2018 WSIP CSRE ACDD RH DT2300 minus

Base - Calaveras Constrained

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	7	3	0	-121	-1	-2	-3	11	6	7	7	7
W	1998	7	4	3	-117	-12	-2	-3	3	5	6	7	7
W	1958	7	5	4	9	-50	-2	-3	3	7	7	7	7
W	1941	7	5	1	-16	-115	-2	-3	3	7	7	7	7
W	1982	7	3	2	-120	-1	-2	-3	3	7	7	7	7
W	1995	7	5	5	-271	16	-17	2	5	6	7	7	7
W	1956	7	5	-118	-1	-1	12	5	6	7	7	7	7
W	1952	7	5	0	-121	-1	-2	2	5	7	7	7	7
W	1938	7	5	0	8	-52	-2	-3	5	7	7	7	7
W	1997	7	1	-89	-1	16	16	6	6	7	7	7	7
W	1969	7	5	3	-120	-1	-2	4	6	7	7	7	7
W	1973	7	1	3	-125	-1	-2	4	6	7	7	7	7
W	1986	7	5	5	13	-223	-2	3	6	7	7	7	7
W	1980	7	5	3	-116	-107	-2	4	6	7	7	7	7
W	1942	7	5	0	-90	-35	11	2	3	7	7	7	7
W	1967	7	5	1	-79	-20	-25	-3	1	7	7	7	7
AN	1963	6	5	4	-44	-107	12	2	1	7	7	7	7
AN	1940	7	5	5	5	-174	-2	-3	5	7	7	7	7
AN	1965	7	5	-19	-185	16	16	55	5	7	7	7	7
AN	1996	7	5	4	-84	-52	-2	5	5	6	7	7	7
AN	1922	7	5	0	10	-62	-2	4	6	7	7	7	7
AN	1975	7	5	4	13	-234	-15	-3	5	7	7	7	7
AN	1974	7	2	-13	-68	18	23	-3	5	6	7	7	7
AN	1978	7	5	4	-150	-131	-33	1	5	7	7	7	7
AN	1993	7	5	4	-187	-115	-2	5	5	7	7	7	7
AN	1951	7	0	-51	-39	-15	5	6	6	7	7	7	7
AN	1943	7	4	4	-113	-24	-2	4	6	7	7	7	7
AN	1927	7	4	4	10	-50	13	5	6	6	7	7	7
AN	1937	7	5	5	13	-64	-53	2	5	7	7	7	7
AN	2000	7	5	5	11	-168	-41	6	6	7	7	7	7
AN	1921	7	5	0	-100	-24	14	6	6	7	7	7	7
AN	1999	7	5	4	10	-50	13	23	5	6	7	7	7
AN	1923	7	5	-46	-21	-3	16	6	7	7	7	7	7
N	1953	7	5	0	-121	17	13	6	5	7	7	7	7
N	1928	7	5	3	12	16	-63	-3	7	7	7	7	7
N	1970	7	5	4	-106	17	-18	6	6	7	7	7	7
N	1984	7	1	-56	12	19	16	6	6	7	7	7	7
N	1946	7	5	-76	-17	17	15	5	6	7	7	7	7
N	1926	7	5	5	14	-186	17	3	7	7	7	7	7
N	1936	7	5	5	12	-107	14	4	6	7	7	7	7
N	1945	7	5	5	13	-112	13	5	5	7	7	7	7
N	1971	7	4	-20	9	19	14	5	6	7	7	7	7
N	1935	7	5	5	5	19	14	0	5	7	7	7	7
N	1932	7	5	0	10	11	16	7	7	7	7	7	7
N	1979	7	5	5	11	9	12	5	6	7	7	7	7
N	1962	7	5	5	14	-52	12	6	6	7	7	7	7
N	1949	7	5	5	13	19	-109	5	6	7	7	7	7
N	1992	7	5	5	13	-73	14	6	6	7	7	7	7
N	1981	7	5	5	6	19	10	6	6	7	7	7	7
BN	2001	7	5	5	13	12	11	6	6	7	7	7	7
BN	1930	7	5	5	11	18	7	6	6	7	7	7	7
BN	1954	7	5	5	11	14	13	5	6	7	7	7	7
BN	1968	7	5	5	8	17	14	6	6	7	7	7	7
BN	1959	7	5	5	11	10	16	6	7	7	7	7	7
BN	1925	7	5	4	13	9	16	5	6	7	7	7	7
BN	1944	7	5	5	13	13	12	6	6	7	7	7	7
BN	2002	7	5	1	11	19	13	6	6	7	7	7	7
BN	1950	7	5	5	9	14	16	6	6	7	7	7	7
BN	1966	7	4	2	11	16	16	7	7	7	7	7	7
BN	1955	7	5	2	9	19	16	6	6	7	7	7	7
BN	1957	7	5	5	13	13	15	6	5	7	7	7	7
BN	1934	7	5	3	10	16	16	7	7	7	7	7	7
BN	1985	7	3	4	13	18	14	7	6	7	7	7	7
BN	1991	7	5	5	14	20	9	6	7	7	7	7	7
BN	1929	7	5	4	13	19	16	7	7	7	7	7	7
BN	1964	7	4	5	9	19	16	7	6	7	7	7	7
D	1947	7	4	4	13	18	15	7	7	7	7	7	7
D	1994	7	5	5	13	15	16	7	6	7	7	7	7
D	1939	7	5	4	13	18	15	7	7	7	7	7	7
D	1948	7	5	5	13	19	15	4	5	7	7	7	7
D	1960	7	5	5	13	15	17	7	7	7	7	7	7
D	1972	7	5	3	13	18	17	7	7	7	7	7	7
D	1933	7	5	5	12	19	16	7	6	7	7	7	7
D	1961	7	5	5	13	19	16	7	7	7	7	7	7
D	1990	7	5	5	13	19	17	7	7	7	7	7	7
D	1987	7	5	5	13	19	16	7	7	7	7	7	7
D	1988	7	5	4	13	20	17	7	7	7	7	7	7
D	1989	7	5	5	13	20	16	7	7	7	7	7	7
D	1931	7	5	5	13	19	17	7	7	7	7	7	7
D	1976	7	5	5	14	20	17	7	7	7	7	7	7
D	1977	7	5	5	13	20	17	7	7	7	7	7	7
D	1924	7	5	5	14	20	17	7	7	7	7	7	7

Table A6.1

Estimated Average Annual FLOW IN ALAMEDA CREEK BELOW SAN ANTONIO CK CONFLUENCE (3) under Various Conditions (AF per year)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Hydrologic Year Type	Abbrev.	Percentile	Base, Baseline Condition (2005), Calaveras Down	2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up
All	-		(a)	(b)
			27,717	23,478
Wet	W	81-100%	88,377	80,949
Above Normal	AN	61-80%	36,999	27,746
Normal	N	41-60%	11,126	6,657
Below Normal	BN	21-40%	2,363	2,368
Dry	D	0-20%	724	724

(a) 265mgd Existing Setting, Calaveras and Crystal Springs Constrained

(b)

Table A6.3

Estimated Average Monthly FLOW IN ALAMEDA CREEK BELOW SAN ANTONIO CK CONFLUENCE (3) Under Various Conditions (AF per month)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Base, Baseline Condition (2005), Calaveras Down												
All	9	89	1,587	6,264	10,243	6,596	2,642	223	38	14	7	4
Wet	6	154	4,075	20,200	31,356	21,129	10,745	579	76	33	15	9
Above Normal	19	150	1,948	8,630	15,057	8,951	1,878	276	54	20	9	6
Normal	7	64	1,725	2,208	4,146	2,261	544	128	28	9	4	3
Below Normal	7	56	183	404	720	717	154	91	20	5	3	2
Dry	6	19	70	98	231	145	91	48	9	3	2	2

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

All	9	89	1,324	4,500	8,369	6,178	2,702	245	38	14	7	4
Wet	6	154	3,525	16,057	28,945	20,933	10,485	710	76	33	15	9
Above Normal	19	150	1,576	4,896	10,460	7,972	2,331	251	54	20	9	6
Normal	7	64	1,321	1,276	1,882	1,332	596	135	28	9	4	3
Below Normal	7	56	183	404	678	733	185	91	20	5	3	2
Dry	6	19	70	98	231	145	91	48	9	3	2	2

Percent Change, Base vs 2018 ACDD Release

All	0%	0%	-17%	-28%	-18%	-6%	2%	10%	0%	0%	0%	0%
Wet	0%	0%	-13%	-21%	-8%	-1%	-2%	23%	0%	0%	0%	0%
Above Normal	0%	0%	-19%	-43%	-31%	-11%	24%	-9%	0%	0%	0%	0%
Normal	0%	0%	-23%	-42%	-55%	-41%	10%	5%	0%	0%	0%	0%
Below Normal	0%	0%	0%	0%	-6%	2%	20%	0%	0%	0%	0%	0%
Dry	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

* Indicates an increase from zero release in Baseline Case. See tables above for actual increase.

Table A6.2

Estimated Monthly Statistics for FLOW IN ALAMEDA CREEK BELOW SAN ANTONIO CK CONFLUENCE (3) (AF per month)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Base, Baseline Condition (2005), Calaveras Down												
Average	9	89	1,587	6,264	10,243	6,596	2,642	223	38	14	7	4
Minimum	1	0	0	0	0	0	2	0	0	0	0	0
Median	5	18	117	633	1,156	716	237	121	30	9	4	3
Maximum	177	950	36,312	61,834	84,253	80,700	50,114	3,127	230	110	51	30
Std. Deviation	20	197	4,948	11,521	16,455	12,992	8,347	431	34	16	7	4

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

Average	9	89	1,324	4,500	8,369	6,178	2,702	245	38	14	7	4
Minimum	-4	0	0	0	0	0	2	0	0	0	0	0
Median	5	18	117	613	1,164	679	255	121	30	9	4	3
Maximum	177	950	32,302	61,788	83,564	80,599	49,452	4,948	230	110	51	30
Std. Deviation	20	197	4,208	9,587	15,242	12,653	8,115	572	34	16	7	4

Table A6.2b (Transposed)

Estimated Average Monthly FLOW IN ALAMEDA CREEK BELOW SAN ANTONIO CK CONFLUENCE (3) Under Various Conditions (CFS)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Base, Baseline Condition (2005), Calaveras Down

	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	0	0	0	0	0	0
Nov	3	3	1	1	0	1
Dec	66	32	28	3	1	26
Jan	329	140	36	7	2	102
Feb	560	269	74	13	4	183
Mar	344	146	37	12	2	107
Apr	181	32	9	3	2	44
May	9	4	2	1	1	4
June	1	1	0	0	0	1
July	1	0	0	0	0	0
Aug	0	0	0	0	0	0
Sept	0	0	0	0	0	0

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	0	0	0	0	0	0
Nov	3	3	1	1	0	1
Dec	57	26	21	3	1	22
Jan	261	80	21	7	2	73
Feb	517	187	34	12	4	149
Mar	340	130	22	12	2	100
Apr	176	39	10	3	2	45
May	12	4	2	1	1	4
June	1	1	0	0	0	1
July	1	0	0	0	0	0
Aug	0	0	0	0	0	0
Sept	0	0	0	0	0	0

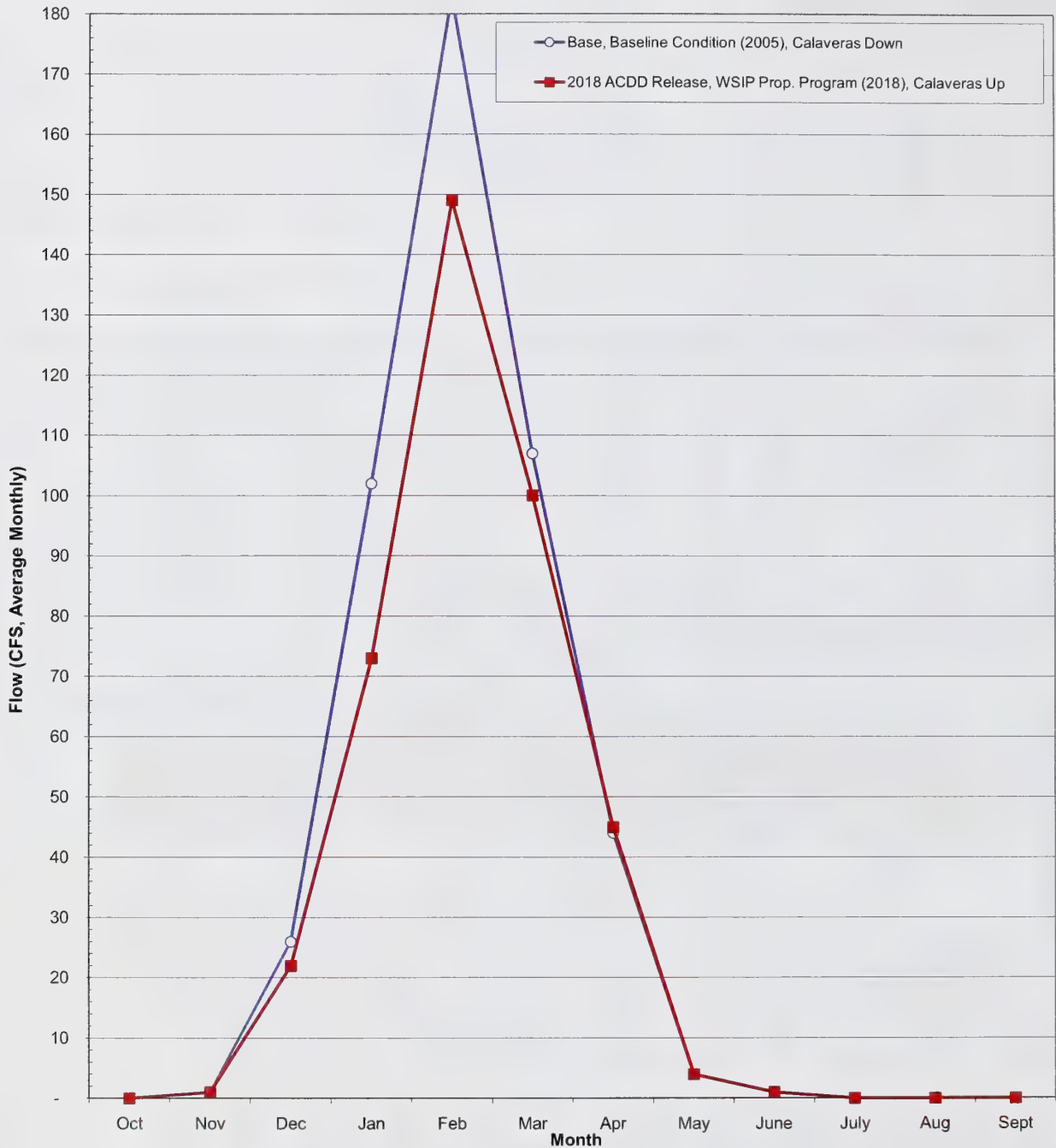
Delta and Percent Change, Base vs 2018 ACDD Release

	Wet	Above Normal	Normal	Below Normal	Dry	All
Oct	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]
Nov	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]
Dec	-9 [-14%]	-6 [-19%]	-7 [-25%]	0 [0%]	0 [0%]	-4 [-15%]
Jan	-68 [-21%]	-60 [-43%]	-15 [-42%]	0 [0%]	0 [0%]	-29 [-28%]
Feb	-43 [-8%]	-82 [-30%]	-40 [-54%]	-1 [-8%]	0 [0%]	-34 [-19%]
Mar	-4 [-1%]	-16 [-11%]	-15 [-41%]	0 [0%]	0 [0%]	-7 [-7%]
Apr	-5 [-3%]	7 [22%]	1 [11%]	0 [0%]	0 [0%]	1 [2%]
May	3 [33%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]
June	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]
July	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]
Aug	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]
Sept	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]

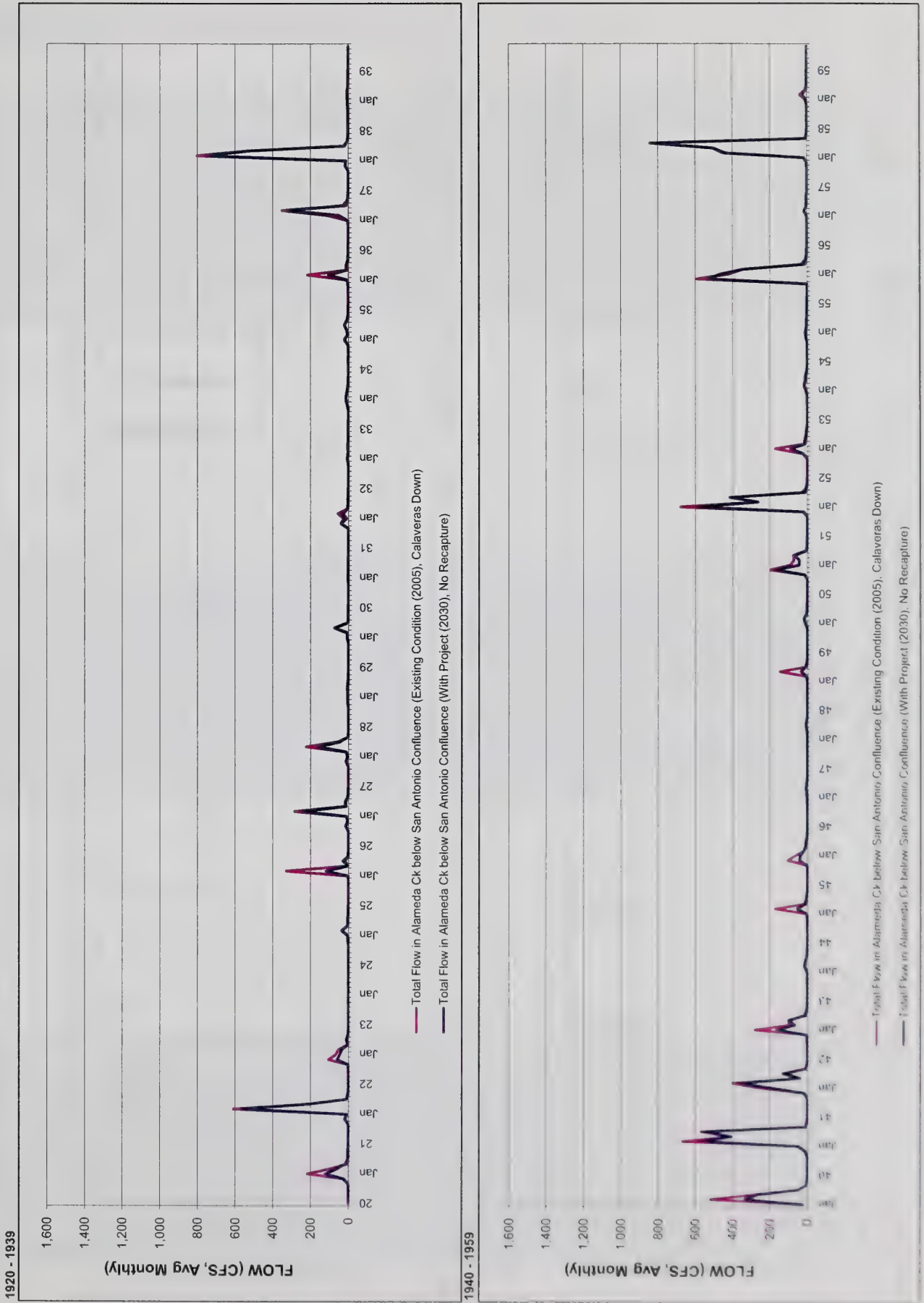
Key

	> 0%
	< 0 to -5%
	< -5%

A6.4 - Average Monthly Flows FLOW IN ALAMEDA CREEK BELOW SAN ANTONIO CK CONFLUENCE (3)



A6.9 CHRONOLOGICAL ALAMEDA CREEK FLOW (3) BELOW THE SAN ANTONIO CONFLUENCE



Source: Hydrologic Modeling, Alameda Creek, San Antonio Confluence, 2005, 2030, 2040, 2050, 2060, 2070, 2080, 2090, 2100, 2110, 2120, 2130, 2140, 2150, 2160, 2170, 2180, 2190, 2200, 2210, 2220, 2230, 2240, 2250, 2260, 2270, 2280, 2290, 2300, 2310, 2320, 2330, 2340, 2350, 2360, 2370, 2380, 2390, 2400, 2410, 2420, 2430, 2440, 2450, 2460, 2470, 2480, 2490, 2500, 2510, 2520, 2530, 2540, 2550, 2560, 2570, 2580, 2590, 2600, 2610, 2620, 2630, 2640, 2650, 2660, 2670, 2680, 2690, 2700, 2710, 2720, 2730, 2740, 2750, 2760, 2770, 2780, 2790, 2800, 2810, 2820, 2830, 2840, 2850, 2860, 2870, 2880, 2890, 2900, 2910, 2920, 2930, 2940, 2950, 2960, 2970, 2980, 2990, 3000, 3010, 3020, 3030, 3040, 3050, 3060, 3070, 3080, 3090, 3100, 3110, 3120, 3130, 3140, 3150, 3160, 3170, 3180, 3190, 3200, 3210, 3220, 3230, 3240, 3250, 3260, 3270, 3280, 3290, 3300, 3310, 3320, 3330, 3340, 3350, 3360, 3370, 3380, 3390, 3400, 3410, 3420, 3430, 3440, 3450, 3460, 3470, 3480, 3490, 3500, 3510, 3520, 3530, 3540, 3550, 3560, 3570, 3580, 3590, 3600, 3610, 3620, 3630, 3640, 3650, 3660, 3670, 3680, 3690, 3700, 3710, 3720, 3730, 3740, 3750, 3760, 3770, 3780, 3790, 3800, 3810, 3820, 3830, 3840, 3850, 3860, 3870, 3880, 3890, 3900, 3910, 3920, 3930, 3940, 3950, 3960, 3970, 3980, 3990, 4000, 4010, 4020, 4030, 4040, 4050, 4060, 4070, 4080, 4090, 4100, 4110, 4120, 4130, 4140, 4150, 4160, 4170, 4180, 4190, 4200, 4210, 4220, 4230, 4240, 4250, 4260, 4270, 4280, 4290, 4300, 4310, 4320, 4330, 4340, 4350, 4360, 4370, 4380, 4390, 4400, 4410, 4420, 4430, 4440, 4450, 4460, 4470, 4480, 4490, 4500, 4510, 4520, 4530, 4540, 4550, 4560, 4570, 4580, 4590, 4600, 4610, 4620, 4630, 4640, 4650, 4660, 4670, 4680, 4690, 4700, 4710, 4720, 4730, 4740, 4750, 4760, 4770, 4780, 4790, 4800, 4810, 4820, 4830, 4840, 4850, 4860, 4870, 4880, 4890, 4900, 4910, 4920, 4930, 4940, 4950, 4960, 4970, 4980, 4990, 5000, 5010, 5020, 5030, 5040, 5050, 5060, 5070, 5080, 5090, 5100, 5110, 5120, 5130, 5140, 5150, 5160, 5170, 5180, 5190, 5200, 5210, 5220, 5230, 5240, 5250, 5260, 5270, 5280, 5290, 5300, 5310, 5320, 5330, 5340, 5350, 5360, 5370, 5380, 5390, 5400, 5410, 5420, 5430, 5440, 5450, 5460, 5470, 5480, 5490, 5500, 5510, 5520, 5530, 5540, 5550, 5560, 5570, 5580, 5590, 5600, 5610, 5620, 5630, 5640, 5650, 5660, 5670, 5680, 5690, 5700, 5710, 5720, 5730, 5740, 5750, 5760, 5770, 5780, 5790, 5800, 5810, 5820, 5830, 5840, 5850, 5860, 5870, 5880, 5890, 5900, 5910, 5920, 5930, 5940, 5950, 5960, 5970, 5980, 5990, 6000, 6010, 6020, 6030, 6040, 6050, 6060, 6070, 6080, 6090, 6100, 6110, 6120, 6130, 6140, 6150, 6160, 6170, 6180, 6190, 6200, 6210, 6220, 6230, 6240, 6250, 6260, 6270, 6280, 6290, 6300, 6310, 6320, 6330, 6340, 6350, 6360, 6370, 6380, 6390, 6400, 6410, 6420, 6430, 6440, 6450, 6460, 6470, 6480, 6490, 6500, 6510, 6520, 6530, 6540, 6550, 6560, 6570, 6580, 6590, 6600, 6610, 6620, 6630, 6640, 6650, 6660, 6670, 6680, 6690, 6700, 6710, 6720, 6730, 6740, 6750, 6760, 6770, 6780, 6790, 6800, 6810, 6820, 6830, 6840, 6850, 6860, 6870, 6880, 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10180, 10190, 10200, 10210, 10220, 10230, 10240, 10250, 10260, 10270, 10280, 10290, 10300, 10310, 10320, 10330, 10340, 10350, 10360, 10370, 10380, 10390, 10400, 10410, 10420, 10430, 10440, 10450, 10460, 10470, 10480, 10490, 10500, 10510, 10520, 10530, 10540, 10550, 10560, 10570, 10580, 10590, 10600, 10610, 10620, 10630, 10640, 10650, 10660, 10670, 10680, 10690, 10700, 10710, 10720, 10730, 10740, 10750, 10760, 10770, 10780, 10790, 10800, 10810, 10820, 10830, 10840, 10850, 10860, 10870, 10880, 10890, 10900, 10910, 10920, 10930, 10940, 10950, 10960, 10970, 10980, 10990, 11000, 11010, 11020, 11030, 11040, 11050, 11060, 11070, 11080, 11090, 11100, 11110, 11120, 11130, 11140, 11150, 11160, 11170, 11180, 11190, 11200, 11210, 11220, 11230, 11240, 11250, 11260, 11270, 11280, 11290, 11300, 11310, 11320, 11330, 11340, 11350, 11360, 11370, 11380, 11390, 11400, 11410, 11420, 11430, 11440, 11450, 11460, 11470, 11480, 11490, 11500, 11510, 11520, 11530, 11540, 11550, 11560, 11570, 11580, 11590, 11600, 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18760, 18770, 18780, 18790, 18800, 18810, 18820, 18830, 18840, 18850, 18860, 18870, 18880, 18890, 18900, 18910, 18920, 18930, 18940, 18950, 18960, 18970, 18980, 18990, 19000, 19010, 19020, 19030, 19040, 19050, 19060, 19070, 19080, 19090, 19100, 19110, 19120, 19130, 19140, 19150, 19160, 19170, 19180, 19190, 19200, 19210, 19220, 19230, 19240, 19250, 19260, 19270, 19280, 19290, 19300, 19310, 19320, 19330, 19340, 19350, 19360, 19370, 19380, 19390, 19400, 19410, 19420, 19430, 19440, 19450, 19460, 19470, 19480, 19490, 19500, 19510, 19520, 19530, 19540, 19550, 19560, 19570, 19580, 19590, 19600, 19610, 19620, 19630, 19640, 19650, 19660, 19670, 19680, 19690, 19700, 19710, 19720, 19730, 19740, 19750, 19760, 19770, 19780, 19790, 19800, 19810, 19820, 19830, 19840, 19850, 19860, 19870, 19880, 19890, 19900, 19910, 19920, 19930, 19940, 19950, 19960, 19970, 19980, 19990, 20000, 20010, 20020, 20030, 20040, 20050, 20060, 20070, 20080, 20090, 20100, 20110, 20120, 20130, 20140, 20150, 20160, 20170, 201

A6.9 CHRONOLOGICAL ALAMEDA CREEK FLOW (3) BELOW THE SAN ANTONIO CONFLUENCE



A6.11 FLOW IN ALAMEDA CREEK BELOW THE SAN ANTONIO CK CONFLUENCE (3)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

(3) Total Flow in Alameda Ck below San Antonio Confluence - CFS, Average Monthly

Base - Calaveras Constrained

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	0	5	43	539	877	1,312	182	51	2	1	0	0
W	1998	0	1	5	320	1,504	119	104	8	4	2	1	1
W	1958	0	0	2	16	447	505	842	8	1	0	0	0
W	1941	0	0	11	47	663	411	570	10	1	0	0	0
W	1982	0	4	13	298	265	115	741	9	1	0	0	0
W	1995	0	0	1	672	22	850	25	5	2	1	0	0
W	1956	0	0	591	423	344	13	5	3	1	0	0	0
W	1952	0	0	20	680	262	411	27	4	1	0	0	0
W	1938	0	0	16	13	793	530	23	4	1	0	0	0
W	1997	0	16	318	1,006	9	4	2	1	1	0	0	0
W	1969	0	0	4	414	780	143	8	3	1	0	0	0
W	1973	0	11	4	189	793	266	6	2	1	0	0	0
W	1986	0	0	1	1	812	492	9	3	1	0	0	0
W	1980	0	1	5	200	914	45	6	3	1	0	0	0
W	1942	0	1	17	251	396	37	119	8	1	0	0	0
W	1967	0	1	10	187	73	244	220	30	1	0	0	0
AN	1963	3	0	2	137	515	13	163	28	1	0	0	0
AN	1940	0	0	0	22	514	297	50	3	1	0	0	0
AN	1965	0	1	100	541	24	8	20	4	1	0	0	0
AN	1996	0	0	4	185	760	260	5	3	1	0	0	0
AN	1922	0	0	19	8	604	216	9	2	1	0	0	0
AN	1975	0	1	2	3	334	525	26	4	1	1	0	0
AN	1974	0	6	72	208	8	76	167	4	1	1	0	0
AN	1978	0	0	2	275	222	270	16	3	1	0	0	0
AN	1993	0	0	3	288	410	77	5	3	1	0	0	0
AN	1951	0	15	197	91	71	74	4	3	1	0	0	0
AN	1943	0	2	2	282	102	95	7	3	1	0	0	0
AN	1927	0	14	3	8	282	19	14	2	1	0	0	0
AN	1937	0	0	0	2	109	351	12	3	1	0	0	0
AN	2000	0	0	1	27	297	170	4	2	1	0	0	0
AN	1921	0	1	25	218	95	5	3	2	1	0	0	0
AN	1999	1	1	2	24	169	14	24	4	2	1	0	0
AN	1923	0	1	105	68	52	3	7	1	0	0	0	0
N	1953	0	0	23	171	14	9	4	3	1	0	0	0
N	1928	0	0	13	4	11	222	56	1	0	0	0	0
N	1970	0	0	2	181	19	75	3	1	0	0	0	0
N	1984	0	10	208	12	3	4	4	3	1	0	0	0
N	1946	0	1	105	63	17	6	4	2	1	0	0	0
N	1926	0	0	0	1	326	3	20	1	0	0	0	0
N	1936	0	0	1	5	214	6	7	2	1	0	0	0
N	1945	0	1	1	3	171	16	5	3	1	0	0	0
N	1971	0	3	55	31	2	7	4	2	1	0	0	0
N	1935	0	0	1	21	2	8	21	4	1	0	0	0
N	1932	0	0	38	25	54	5	2	1	0	0	0	0
N	1979	0	0	0	10	46	12	4	2	0	0	0	0
N	1962	0	0	0	1	135	32	3	2	0	0	0	0
N	1949	0	0	1	1	3	146	4	3	1	0	0	0
N	1992	0	0	1	1	164	20	3	1	0	0	0	0
N	1981	0	0	1	44	4	17	4	1	0	0	0	0
BN	2001	0	0	1	3	20	19	4	1	0	0	0	0
BN	1930	0	0	0	6	6	72	2	1	1	0	0	0
BN	1954	0	1	1	6	17	11	5	2	0	0	0	0
BN	1968	0	0	1	18	8	7	4	2	0	0	0	0
BN	1959	0	0	1	7	35	3	2	1	0	0	0	0
BN	1925	0	0	2	2	34	2	4	2	0	0	0	0
BN	1944	0	0	1	2	15	13	3	2	0	0	0	0
BN	2002	0	0	15	6	4	9	3	1	0	0	0	0
BN	1950	0	0	1	11	18	3	3	1	0	0	0	0
BN	1966	0	3	7	6	9	4	1	1	0	0	0	0
BN	1955	0	0	7	11	3	4	3	2	0	0	0	0
BN	1957	0	0	1	2	16	4	3	4	0	0	0	0
BN	1934	0	0	6	13	9	3	1	0	0	0	0	0
BN	1985	0	6	3	1	18	7	1	1	0	0	0	0
BN	1991	0	0	0	0	0	29	3	1	0	0	0	0
BN	1929	0	0	4	3	4	5	2	0	0	0	0	0
BN	1964	0	3	1	15	2	2	2	1	0	0	0	0
D	1947	0	2	2	2	4	6	4	2	0	0	0	0
D	1994	0	0	1	1	15	2	2	2	0	0	0	0
D	1939	0	1	3	2	5	5	2	1	0	0	0	0
D	1948	0	0	1	1	1	4	7	3	0	0	0	0
D	1960	0	0	0	2	22	1	1	1	0	0	0	0
D	1972	0	0	6	2	4	1	1	0	0	0	0	0
D	1933	0	0	0	5	2	3	2	1	0	0	0	0
D	1961	0	1	1	1	1	4	1	1	0	0	0	0
D	1990	0	1	1	2	2	1	1	1	0	0	0	0
D	1987	0	0	0	1	1	3	1	0	0	0	0	0
D	1988	0	0	2	3	1	1	1	0	0	0	0	0
D	1989	0	0	1	1	1	3	1	0	0	0	0	0
D	1931	0	0	0	2	1	1	0	0	0	0	0	0
D	1976	0	0	0	0	1	1	1	0	0	0	0	0
D	1977	0	0	0	1	0	1	0	0	0	0	0	0
D	1924	0	0	0	0	0	0	0	0	0	0	0	0

A6.11 FLOW IN ALAMEDA CREEK BELOW THE SAN ANTONIO CK CONFLUENCE (3)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)**(3) Total Flow in Alameda Ck below San Antonio Confluence - CFS, Average Monthly**

2018 WSIP CSRE ACDD RH DT2300

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	0	5	43	442	876	1,311	158	80	2	1	0	0
W	1998	0	1	5	219	1,491	109	102	15	4	2	1	1
W	1958	0	0	2	16	435	504	831	8	1	0	0	0
W	1941	0	0	11	52	548	409	545	10	1	0	0	0
W	1982	0	4	13	213	264	122	717	20	1	0	0	0
W	1995	0	0	1	332	9	806	27	5	2	1	0	0
W	1956	0	0	525	467	343	29	9	3	1	0	0	0
W	1952	0	0	20	585	261	416	11	4	1	0	0	0
W	1938	0	0	16	13	736	529	19	4	1	0	0	0
W	1997	0	16	240	1,005	22	8	2	1	1	0	0	0
W	1969	0	0	4	348	779	156	8	3	1	0	0	0
W	1973	0	11	4	82	792	262	14	2	1	0	0	0
W	1986	0	0	1	1	618	490	17	3	1	0	0	0
W	1980	0	1	5	85	691	29	8	3	1	0	0	0
W	1942	0	1	17	186	360	40	132	8	1	0	0	0
W	1967	0	1	10	136	40	227	219	16	1	0	0	0
AN	1963	3	0	2	79	408	18	164	17	1	0	0	0
AN	1940	0	0	0	22	331	269	48	4	1	0	0	0
AN	1965	0	1	81	355	24	4	76	4	1	0	0	0
AN	1996	0	0	4	100	708	234	9	4	1	0	0	0
AN	1922	0	0	19	8	557	216	9	2	1	0	0	0
AN	1975	0	1	2	3	88	447	27	5	1	1	0	0
AN	1974	0	6	65	140	8	96	164	5	1	1	0	0
AN	1978	0	0	2	105	82	237	31	3	1	0	0	0
AN	1993	0	0	3	102	295	65	11	3	1	0	0	0
AN	1951	0	15	167	46	42	68	4	3	1	0	0	0
AN	1943	0	2	2	165	66	101	14	3	1	0	0	0
AN	1927	0	14	3	8	233	11	16	2	1	0	0	0
AN	1937	0	0	0	2	48	314	29	3	1	0	0	0
AN	2000	0	0	1	27	94	91	4	2	1	0	0	0
AN	1921	0	1	25	121	61	15	3	2	1	0	0	0
AN	1999	1	1	2	24	94	17	48	4	2	1	0	0
AN	1923	0	1	58	46	34	3	10	1	0	0	0	0
N	1953	0	0	23	89	14	13	6	3	1	0	0	0
N	1928	0	0	13	4	11	158	44	1	0	0	0	0
N	1970	0	0	2	60	8	34	4	1	0	0	0	0
N	1984	0	10	176	12	3	4	4	3	1	0	0	0
N	1946	0	1	42	38	17	11	8	2	1	0	0	0
N	1926	0	0	0	1	116	3	29	1	0	0	0	0
N	1936	0	0	1	5	103	11	11	2	1	0	0	0
N	1945	0	1	1	3	54	10	5	3	1	0	0	0
N	1971	0	3	44	31	2	7	4	2	1	0	0	0
N	1935	0	0	1	21	2	8	21	6	1	0	0	0
N	1932	0	0	38	10	30	3	2	1	0	0	0	0
N	1979	0	0	0	10	48	14	4	2	0	0	0	0
N	1962	0	0	0	1	58	12	3	2	0	0	0	0
N	1949	0	0	1	1	3	34	8	3	1	0	0	0
N	1992	0	0	1	1	65	8	3	1	0	0	0	0
N	1981	0	0	1	44	4	17	4	1	0	0	0	0
BN	2001	0	0	1	3	20	19	7	1	0	0	0	0
BN	1930	0	0	0	6	6	72	2	1	1	0	0	0
BN	1954	0	1	1	6	17	11	10	2	0	0	0	0
BN	1968	0	0	1	18	8	7	4	2	0	0	0	0
BN	1959	0	0	1	7	23	7	2	1	0	0	0	0
BN	1925	0	0	2	2	34	2	4	2	0	0	0	0
BN	1944	0	0	1	2	15	13	3	2	0	0	0	0
BN	2002	0	0	15	6	4	9	3	1	0	0	0	0
BN	1950	0	0	1	11	18	3	3	1	0	0	0	0
BN	1966	0	3	7	6	9	4	1	1	0	0	0	0
BN	1955	0	0	7	11	3	4	3	2	0	0	0	0
BN	1957	0	0	1	2	16	4	3	4	0	0	0	0
BN	1934	0	0	6	13	9	3	1	0	0	0	0	0
BN	1985	0	6	3	1	18	7	1	1	0	0	0	0
BN	1991	0	0	0	0	0	29	3	1	0	0	0	0
BN	1929	0	0	4	3	4	5	2	0	0	0	0	0
BN	1964	0	3	1	15	2	2	2	1	0	0	0	0
D	1947	0	2	2	2	4	6	4	2	0	0	0	0
D	1994	0	0	1	1	15	2	2	2	0	0	0	0
D	1939	0	1	3	2	5	5	2	1	0	0	0	0
D	1948	0	0	1	1	1	4	7	3	0	0	0	0
D	1960	0	0	0	2	22	1	1	1	0	0	0	0
D	1972	0	0	6	2	4	1	1	0	0	0	0	0
D	1933	0	0	0	5	2	3	2	1	0	0	0	0
D	1961	0	1	1	1	1	4	1	1	0	0	0	0
D	1990	0	1	1	2	2	1	1	1	0	0	0	0
D	1987	0	0	0	1	6	3	1	0	0	0	0	0
D	1988	0	0	2	3	1	1	1	0	0	0	0	0
D	1989	0	0	1	1	1	3	1	0	0	0	0	0
D	1931	0	0	0	2	1	1	0	0	0	0	0	0
D	1976	0	0	0	0	1	1	1	0	0	0	0	0
D	1977	0	0	0	1	0	1	0	0	0	0	0	0
D	1924	0	0	0	0	0	0	0	0	0	0	0	0

A6.11 FLOW IN ALAMEDA CREEK BELOW THE SAN ANTONIO CK CONFLUENCE (3)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)**(3) Total Flow in Alameda Ck below San Antonio Confluence - CFS, Average Monthly**

2018 WSIP CSRE ACDD RH DT2300 minus

Base - Calaveras Constrained

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	0	0	0	-97	-1	-2	-24	30	0	0	0	0
W	1988	0	0	0	-101	-12	-10	-2	7	0	0	0	0
W	1958	0	0	0	0	-12	-2	-11	0	0	0	0	0
W	1941	0	0	0	5	-115	-2	-25	0	0	0	0	0
W	1982	0	0	0	-86	-1	7	-24	11	0	0	0	0
W	1995	0	0	0	-340	-13	-44	2	0	0	0	0	0
W	1956	0	0	-65	44	-1	16	3	0	0	0	0	0
W	1952	0	0	0	-95	-1	5	-16	1	0	0	0	0
W	1938	0	0	0	0	-57	-2	-4	0	0	0	0	0
W	1997	0	0	-78	-1	13	5	0	0	0	0	0	0
W	1969	0	0	0	-66	-1	13	0	0	0	0	0	0
W	1973	0	0	0	-107	-1	-4	8	0	0	0	0	0
W	1986	0	0	0	0	-195	-2	8	0	0	0	0	0
W	1980	0	0	0	-116	-223	-16	2	0	0	0	0	0
W	1942	0	0	0	-65	-35	3	13	0	0	0	0	0
W	1967	0	0	0	-52	-33	-17	0	-14	0	0	0	0
AN	1963	0	0	0	-58	-107	4	0	-12	0	0	0	0
AN	1940	0	0	0	0	-183	-28	-3	1	0	0	0	0
AN	1965	0	0	-19	-185	0	-4	55	0	0	0	0	0
AN	1996	0	0	0	-85	-52	-27	4	1	0	0	0	0
AN	1922	0	0	0	0	-46	0	0	0	0	0	0	0
AN	1975	0	0	0	0	-246	-79	1	1	0	0	0	0
AN	1974	0	0	-7	-68	0	19	-3	2	0	0	0	0
AN	1978	0	0	0	-170	-139	-33	15	0	0	0	0	0
AN	1993	0	0	0	-186	-115	-12	6	0	0	0	0	0
AN	1951	0	0	-31	-45	-29	-6	0	0	0	0	0	0
AN	1943	0	0	0	-117	-36	6	7	0	0	0	0	0
AN	1927	0	0	0	0	-49	-9	3	0	0	0	0	0
AN	1937	0	0	0	0	-61	-37	17	0	0	0	0	0
AN	2000	0	0	0	0	-203	-79	0	0	0	0	0	0
AN	1921	0	0	0	-97	-35	9	0	0	0	0	0	0
AN	1999	0	0	0	0	-75	3	24	0	0	0	0	0
AN	1923	0	0	-46	-21	-18	0	3	0	0	0	0	0
N	1953	0	0	0	-82	0	4	3	0	0	0	0	0
N	1928	0	0	0	0	0	-64	-12	0	0	0	0	0
N	1970	0	0	0	-121	-11	-40	1	0	0	0	0	0
N	1984	0	0	-32	0	0	0	0	0	0	0	0	0
N	1946	0	0	-63	-25	0	5	4	0	0	0	0	0
N	1926	0	0	0	0	-210	0	9	0	0	0	0	0
N	1936	0	0	0	0	-111	4	5	0	0	0	0	0
N	1945	0	0	0	0	-117	-6	0	0	0	0	0	0
N	1971	0	0	-11	0	0	0	0	0	0	0	0	0
N	1935	0	0	0	0	0	0	0	2	0	0	0	0
N	1932	0	0	0	-15	-24	-2	0	0	0	0	0	0
N	1979	0	0	0	0	2	1	0	0	0	0	0	0
N	1962	0	0	0	0	-77	-20	0	0	0	0	0	0
N	1949	0	0	0	0	0	-112	4	0	0	0	0	0
N	1992	0	0	0	0	-99	-12	0	0	0	0	0	0
N	1981	0	0	0	0	0	0	0	0	0	0	0	0
BN	2001	0	0	0	0	0	0	3	0	0	0	0	0
BN	1930	0	0	0	0	0	0	0	0	0	0	0	0
BN	1954	0	0	0	0	0	1	5	0	0	0	0	0
BN	1968	0	0	0	0	0	0	0	0	0	0	0	0
BN	1959	0	0	0	0	-12	4	0	0	0	0	0	0
BN	1925	0	0	0	0	0	0	0	0	0	0	0	0
BN	1944	0	0	0	0	0	0	0	0	0	0	0	0
BN	2002	0	0	0	0	0	0	0	0	0	0	0	0
BN	1950	0	0	0	0	0	0	0	0	0	0	0	0
BN	1966	0	0	0	0	0	0	0	0	0	0	0	0
BN	1955	0	0	0	0	0	0	0	0	0	0	0	0
BN	1957	0	0	0	0	0	0	0	0	0	0	0	0
BN	1934	0	0	0	0	0	0	0	0	0	0	0	0
BN	1985	0	0	0	0	0	0	0	0	0	0	0	0
BN	1991	0	0	0	0	0	0	0	0	0	0	0	0
BN	1929	0	0	0	0	0	0	0	0	0	0	0	0
BN	1964	0	0	0	0	0	0	0	0	0	0	0	0
D	1947	0	0	0	0	0	0	0	0	0	0	0	0
D	1994	0	0	0	0	0	0	0	0	0	0	0	0
D	1939	0	0	0	0	0	0	0	0	0	0	0	0
D	1948	0	0	0	0	0	0	0	0	0	0	0	0
D	1960	0	0	0	0	0	0	0	0	0	0	0	0
D	1972	0	0	0	0	0	0	0	0	0	0	0	0
D	1933	0	0	0	0	0	0	0	0	0	0	0	0
D	1961	0	0	0	0	0	0	0	0	0	0	0	0
D	1990	0	0	0	0	0	0	0	0	0	0	0	0
D	1987	0	0	0	0	0	0	0	0	0	0	0	0
D	1988	0	0	0	0	0	0	0	0	0	0	0	0
D	1989	0	0	0	0	0	0	0	0	0	0	0	0
D	1931	0	0	0	0	0	0	0	0	0	0	0	0
D	1976	0	0	0	0	0	0	0	0	0	0	0	0
D	1977	0	0	0	0	0	0	0	0	0	0	0	0
D	1924	0	0	0	0	0	0	0	0	0	0	0	0

Table A7.5

Estimated Average Monthly Storage in CALAVERAS RESERVOIR Under Various Conditions (AF)

5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Base, Baseline Condition (2005), Calaveras Down												
All	31,149	31,183	32,274	33,837	34,831	34,394	35,441	35,706	35,008	34,331	33,611	32,511
Wet	31,151	31,369	32,670	36,828	37,771	37,604	37,722	37,745	36,460	35,888	35,113	33,562
Above Normal	31,141	31,151	33,222	35,649	37,667	36,726	37,685	37,743	36,825	36,130	35,277	33,617
Normal	31,302	31,278	33,015	33,713	34,847	34,096	36,180	36,633	36,219	35,439	34,611	33,257
Below Normal	31,215	31,188	31,370	31,579	32,408	32,039	33,396	34,025	33,602	32,831	32,188	31,683
Dry	30,931	30,931	31,090	31,444	31,438	31,506	32,210	32,363	31,910	31,347	30,851	30,420

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

All	83,583	79,504	79,914	84,774	88,852	90,766	91,166	91,072	90,059	88,937	87,793	86,544
Wet	85,834	82,172	83,527	93,228	96,174	96,564	96,600	96,583	95,091	94,133	93,050	91,589
Above Normal	84,324	79,952	81,310	89,296	95,560	96,425	96,670	96,650	95,695	94,608	93,467	91,956
Normal	82,009	78,047	79,534	82,793	88,562	93,226	94,238	94,268	93,405	92,213	91,027	89,880
Below Normal	83,618	78,753	77,687	80,664	85,188	88,576	89,114	89,096	88,248	87,048	85,873	84,784
Dry	82,079	78,617	77,566	77,864	78,588	78,824	78,994	78,539	77,619	76,449	75,314	74,284

Percent Change, Base vs 2018 ACDD Release

All	168%	155%	148%	151%	155%	164%	157%	155%	157%	159%	161%	166%
Wet	176%	162%	156%	153%	155%	157%	156%	156%	161%	162%	165%	173%
Above Normal	171%	157%	145%	150%	154%	163%	157%	156%	160%	162%	165%	174%
Normal	162%	150%	141%	146%	154%	173%	160%	157%	158%	160%	163%	170%
Below Normal	168%	153%	148%	155%	163%	176%	167%	162%	163%	165%	167%	168%
Dry	165%	154%	149%	148%	150%	150%	145%	143%	143%	144%	144%	144%

A7.7 - Reservoir Storage Volume, Annual Average CALAVERAS RESERVOIR

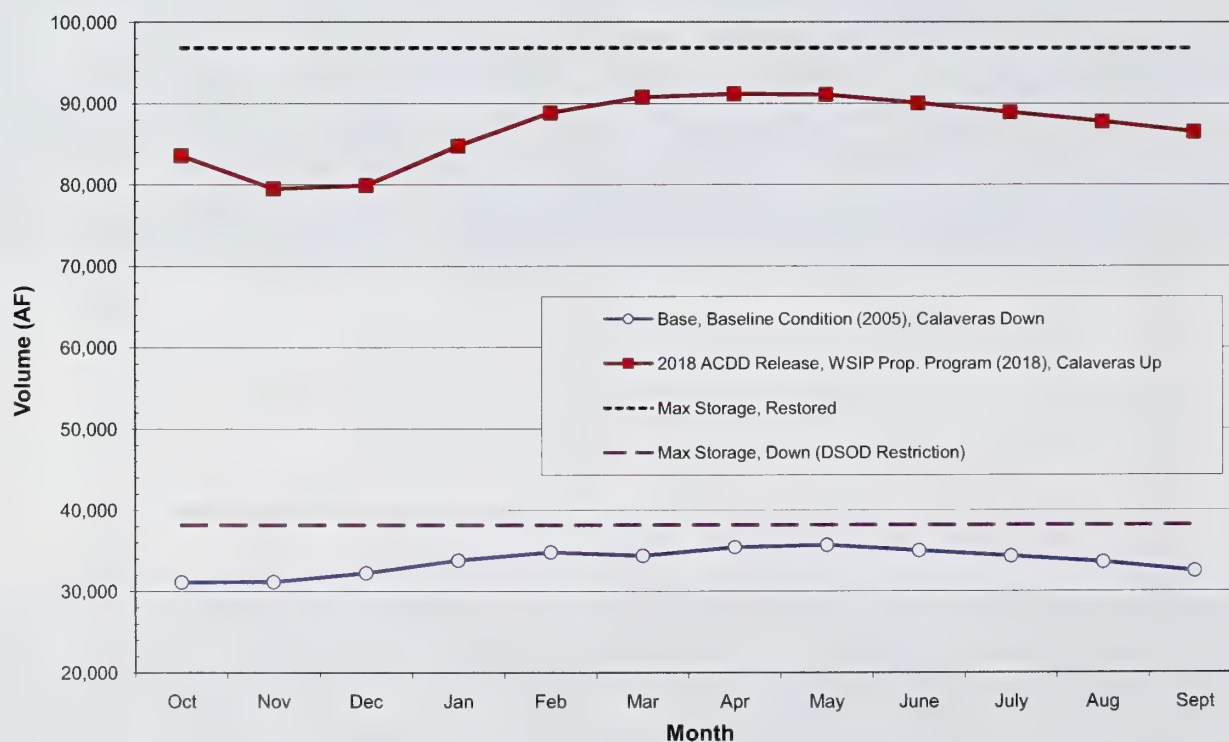


Table A7.6

Estimated Average Monthly Reservoir Water Surface Elevation in CALAVERAS Under Various Conditions (FT, USGS)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

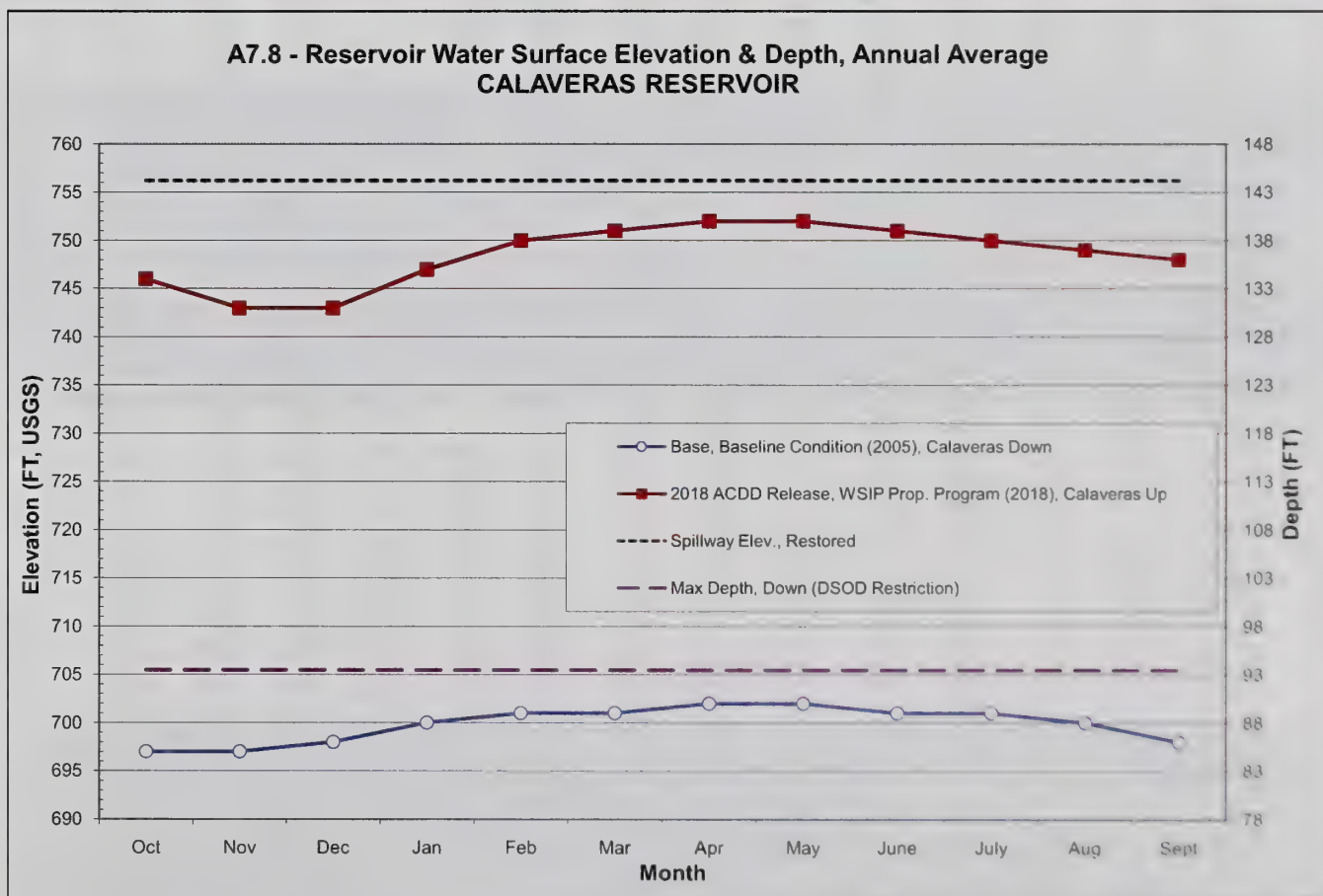
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Base, Baseline Condition (2005), Calaveras Down												
All	697	697	698	700	701	701	702	702	701	701	700	698
Wet	697	697	699	703	705	704	704	704	703	702	701	700
Above Normal	697	697	699	702	704	703	704	704	703	703	702	700
Normal	697	697	699	700	701	700	703	703	703	702	701	699
Below Normal	697	697	697	697	698	698	699	700	700	699	698	697
Dry	696	696	697	697	697	697	698	698	698	697	696	696

2018 ACDD Release, WSIP Prop. Program (2018), Calaveras Up

All	746	743	743	747	750	751	752	752	751	750	749	748
Wet	748	745	746	753	755	756	756	756	755	754	753	752
Above Normal	747	743	744	750	755	755	756	756	755	754	753	752
Normal	745	742	743	746	750	753	754	754	753	752	752	751
Below Normal	746	742	742	744	747	750	750	750	750	749	748	747
Dry	745	742	741	742	742	742	743	742	742	741	740	739

Delta, Base vs 2018 ACDD Release

All	49	46	45	47	49	50	50	50	50	49	49	50
Wet	51	48	47	50	50	52	52	52	52	52	52	52
Above Normal	50	46	45	48	51	52	52	52	52	51	51	52
Normal	48	45	44	46	49	53	51	51	50	50	51	52
Below Normal	49	45	45	47	49	52	51	50	50	50	50	50
Dry	49	46	44	45	45	45	45	44	44	44	44	43



A7.11 CALAVERAS RESERVOIR STORAGE

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

Calaveras Reservoir Storage

Base - Calaveras Constrained

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
W	1983	31,610	31,610	33,640	38,054	38,054	38,054	38,054	38,054	34,288	33,829	33,343	33,092	421,683
W	1998	31,177	31,610	31,610	38,054	38,054	38,054	38,054	38,054	36,685	36,921	35,906	33,758	427,938
W	1958	31,610	31,610	31,610	31,610	38,054	38,054	38,054	38,054	37,038	36,422	35,728	33,758	421,602
W	1941	31,610	31,610	31,610	38,054	38,054	38,054	38,054	38,054	36,176	35,560	34,992	33,758	425,586
W	1982	31,610	31,610	31,610	38,054	38,054	38,054	38,054	38,054	36,451	35,814	35,235	33,758	428,359
W	1995	31,093	31,185	31,610	38,054	35,483	38,054	38,054	38,054	35,887	35,718	35,274	33,758	422,224
W	1956	31,454	31,416	38,054	38,054	38,054	37,594	38,054	38,054	37,853	37,179	35,906	33,758	435,432
W	1952	31,610	31,610	34,069	38,054	38,054	38,054	38,054	38,054	37,003	36,341	35,697	33,758	430,358
W	1938	31,610	31,610	31,610	31,626	38,054	38,054	38,054	38,054	36,999	36,331	35,693	33,758	421,452
W	1997	31,610	31,610	38,054	38,054	36,087	31,610	32,734	33,128	32,821	32,128	31,551	31,285	400,672
W	1969	31,400	31,518	31,610	38,054	38,054	38,054	38,054	38,054	37,863	37,151	35,906	33,758	429,478
W	1973	29,031	31,610	31,610	38,054	38,054	38,054	38,054	38,054	37,815	37,089	35,906	33,758	427,091
W	1986	30,194	30,245	30,786	31,306	38,054	38,054	38,054	38,033	36,973	36,278	35,671	33,758	417,407
W	1980	31,610	31,610	31,610	38,054	38,054	38,054	38,054	38,054	37,830	37,149	35,906	33,758	429,743
W	1942	31,610	31,610	32,016	38,054	38,054	37,751	38,054	38,054	36,121	35,428	34,824	33,758	425,335
W	1967	29,577	29,836	31,610	38,054	38,054	38,054	38,054	38,054	35,553	34,864	34,267	33,758	419,737
AN	1963	31,610	31,610	31,610	38,054	38,054	37,763	38,054	38,054	35,565	34,889	34,298	33,758	423,319
AN	1940	30,020	29,943	30,006	35,827	38,054	38,054	38,054	38,054	36,962	36,245	35,623	33,758	420,601
AN	1965	29,181	29,506	38,054	38,054	36,584	31,610	37,970	38,054	37,821	37,101	35,906	33,758	423,599
AN	1996	31,610	31,610	31,610	38,054	38,054	38,054	38,054	38,054	37,044	36,452	35,736	33,758	428,090
AN	1922	31,171	31,115	31,610	31,610	38,054	38,054	38,054	38,039	36,871	36,133	35,503	33,758	419,973
AN	1975	31,610	31,610	31,610	31,610	38,054	38,054	38,054	38,054	37,028	36,451	35,753	33,758	421,646
AN	1974	31,610	31,202	38,054	38,054	32,948	38,054	38,054	38,054	37,059	36,516	35,752	33,758	429,115
AN	1978	29,060	28,986	30,459	38,054	38,054	38,054	38,054	38,054	35,584	34,889	34,280	33,758	417,289
AN	1993	31,234	31,163	31,610	38,054	38,054	38,054	38,054	38,054	36,089	35,354	34,729	33,758	424,210
AN	1951	31,029	31,610	38,054	38,054	38,054	38,054	38,054	38,054	37,817	37,082	35,906	33,758	435,528
AN	1943	31,610	31,610	31,610	38,054	38,054	38,054	38,054	38,054	37,803	37,049	35,901	33,758	429,612
AN	1927	31,610	31,610	31,610	31,610	38,054	36,548	38,054	38,054	37,694	36,910	35,855	33,758	421,366
AN	1937	31,610	31,556	31,610	31,610	38,054	38,054	38,054	38,054	36,934	36,174	35,535	33,758	421,003
AN	2000	31,610	31,610	31,610	31,610	38,054	38,054	38,054	38,054	37,788	37,107	35,906	33,758	423,215
AN	1921	31,610	31,610	36,003	38,054	38,054	32,138	33,121	33,560	33,094	32,325	31,693	31,356	402,617
AN	1999	31,610	31,610	31,610	31,610	38,054	36,502	38,054	38,054	37,994	37,457	35,906	33,758	422,218
AN	1923	31,610	31,610	38,054	38,054	38,054	31,192	36,799	37,275	36,873	36,077	35,419	33,758	424,777
N	1953	31,610	31,610	35,871	38,054	34,411	31,285	33,191	34,979	34,711	33,939	33,302	32,956	405,919
N	1928	31,610	31,568	31,610	31,610	31,610	38,054	38,054	38,054	37,369	36,566	35,745	33,758	415,607
N	1970	31,610	31,610	31,610	38,054	35,366	38,054	38,054	38,054	37,700	36,889	35,848	33,758	426,607
N	1984	31,610	31,610	38,054	33,424	31,437	31,610	33,584	35,128	34,892	34,123	33,488	33,144	402,102
N	1946	31,610	31,610	38,054	38,054	35,102	31,610	33,817	34,998	34,708	33,927	33,287	32,938	409,716
N	1926	31,610	31,528	31,564	31,610	38,054	31,531	38,054	38,054	37,623	36,803	35,815	33,758	416,006
N	1936	31,610	31,574	31,610	31,610	38,054	33,285	37,045	38,054	37,743	36,937	35,859	33,758	417,141
N	1945	31,610	31,610	31,610	31,610	38,054	35,912	38,054	38,054	37,755	36,953	35,865	33,758	420,845
N	1971	31,610	31,610	38,054	37,840	31,552	31,118	33,310	34,063	33,815	33,041	32,392	32,042	400,446
N	1935	30,094	30,168	30,592	36,382	31,610	31,610	38,054	38,054	36,031	35,237	34,585	33,758	406,175
N	1932	29,550	29,475	32,696	31,610	36,322	31,610	32,498	32,712	32,623	31,826	31,185	30,842	382,948
N	1979	31,610	31,610	31,610	31,610	37,835	37,158	38,054	38,054	37,608	36,791	35,811	33,758	421,508
N	1962	30,272	30,201	30,481	30,845	38,054	37,296	38,054	38,054	37,949	37,118	35,906	33,758	417,990
N	1949	31,610	31,550	31,610	31,610	31,610	38,054	38,054	38,054	37,740	36,928	35,857	33,758	416,434
N	1992	31,593	31,518	31,610	31,610	38,054	34,436	36,207	36,541	36,448	36,013	35,574	33,483	413,087
N	1981	31,610	31,596	31,610	33,884	30,428	32,911	34,794	35,224	34,785	33,936	33,257	32,886	396,921
BN	2001	31,610	31,610	31,610	31,610	35,586	35,757	37,711	38,054	37,553	36,718	35,787	33,758	417,362
BN	1930	30,806	30,727	30,788	31,610	31,610	35,834	36,898	37,146	36,561	35,721	35,041	33,758	406,500
BN	1954	31,610	31,610	31,610	31,610	31,826	31,610	34,275	35,134	34,785	33,979	33,326	32,971	394,344
BN	1968	31,610	31,610	31,610	32,810	31,209	31,039	32,945	33,805	33,417	32,609	31,957	31,607	386,226
BN	1959	31,610	31,610	31,610	31,610	37,759	31,140	32,058	32,395	31,970	31,162	30,517	30,174	383,612
BN	1925	28,212	28,140	29,737	31,247	37,510	31,610	33,581	35,509	35,001	34,166	33,493	33,128	391,334
BN	1944	31,610	31,610	31,610	31,610	33,312	32,257	34,118	34,987	34,608	33,797	33,143	32,789	395,449
BN	2002	31,610	31,610	31,610	31,503	30,303	31,206	32,489	32,875	32,474	31,661	31,002	30,643	378,984
BN	1950	31,610	31,541	31,610	31,610	32,124	31,610	33,029	33,513	33,063	32,242	31,587	31,235	384,773
BN	1966	31,610	31,610	31,610	31,542	31,237	31,610	31,826	31,986	31,562	30,758	30,118	29,778	375,244
BN	1955	31,610	31,610	31,610	31,610	29,888	31,525	33,045	33,910	33,492	32,677	32,024	31,671	384,671
BN	1957	31,610	31,610	31,610	31,610	33,935	31,390	32,960	35,154	34,747	33,929	33,271	32,913	394,737
BN	1934	30,592	30,517	31,610	31,610	31,610	31,610	31,985	31,945	31,478	31,052	30,639	30,292	374,939
BN	1985	31,610	31,610	31,610	31,610	31,610	31,610	32,120	32,536	32,166	31,371	30,740	30,404	378,995
BN	1991	30,116	30,015	30,225	30,421	30,582	32,959	34,323	34,522	34,325	33,884	33,450	33,084	387,907
BN	1929	31,610	31,556	31,610	31,610	31,610	31,610	33,173	33,338	32,873	32,038	31,376	31,019	383,422
BN	1964	31,610	31,610	31,610	31,610	29,230	30,284	31,193	31,613	31,161	30,359	29,722	29,386	369,387
D	1947	31,610	31,610	31,610	31,610	31,610	31,610	33,891	34,516	34,127	33,320	32,675	32,330	390,517
D	1994	31,610	31,610	31,610	31,610	31,682	31,610	32,449	33,047	32,547	32,107	31,683	31,327	382,890
D	1939	31,610	31,610	31,610	31,610	31,610	31,610	32,369	32,455	32,014	31,209	30,570	30,232	378,507
D	1948	31,610	31,610	31,610	31,610	31,610	31,610	35,760	37,398	36,922	36,079	35,403	33,758	404,977
D	1960	29,977	29,910	30,022	31,332	31,610	31,581	32,043	32,248	31,720	31,282	30,860	30,508	373,092
D	1972	31,610	31,605	31,610	31,610	31,610	31,505	31,740	31,625	31,072	30,242	29,576	29,226	373,029
D	1933	30,675	30,636	30,759	31,610	30,970	31,610	32,651	33,162	32,641	31,810	31,156	30,808	378,488
D	1961	30,316	30,542	30,870	31,610	31,477	31,							

A7.11 CALAVERAS RESERVOIR STORAGE

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)**Calaveras Reservoir Storage**

2018 WSIP CSRE ACDD RH DT2300

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
W	1983	87,464	82,860	84,839	96,670	96,670	96,670	96,670	96,670	93,468	92,623	91,606	90,655	1,106,867
W	1998	87,464	82,860	82,445	96,040	96,670	96,670	96,670	96,670	95,312	95,197	94,508	92,067	1,112,574
W	1958	87,464	82,860	81,860	87,464	96,670	96,670	96,670	96,670	94,826	93,829	92,733	91,733	1,099,450
W	1941	87,464	82,860	82,860	90,263	96,670	96,670	96,670	96,664	93,973	92,974	91,879	90,881	1,099,830
W	1982	87,464	82,860	82,860	96,670	96,670	96,670	96,670	96,670	94,497	93,475	92,368	91,361	1,108,237
W	1995	84,926	77,918	73,571	96,670	93,128	96,670	96,670	96,670	95,509	94,963	93,990	92,067	1,092,755
W	1956	83,229	82,804	96,670	96,670	96,670	96,670	96,670	96,670	96,072	95,014	93,887	92,067	1,123,096
W	1952	87,464	82,860	85,269	96,670	96,670	96,670	96,670	96,670	95,953	94,901	93,778	92,067	1,115,643
W	1938	87,464	82,860	82,860	87,410	96,670	96,670	96,670	96,670	95,802	94,745	93,620	92,067	1,103,510
W	1997	87,464	84,780	96,670	96,670	93,736	94,962	95,537	95,281	94,538	93,430	92,299	91,317	1,116,684
W	1969	87,464	82,860	82,860	96,670	96,670	96,670	96,670	96,670	96,281	95,182	94,023	92,067	1,114,089
W	1973	77,978	82,860	82,552	96,670	96,670	96,670	96,670	96,670	95,945	94,832	93,682	92,067	1,103,269
W	1986	79,092	78,762	77,815	77,469	96,670	96,670	96,670	96,670	95,877	94,789	93,651	92,067	1,076,203
W	1980	87,464	79,026	77,225	90,745	96,670	96,670	96,670	96,670	96,070	95,005	93,869	92,067	1,098,153
W	1942	87,464	82,860	83,216	94,749	96,670	96,670	96,670	96,670	94,349	93,266	92,132	91,108	1,105,824
W	1967	86,015	82,860	82,860	94,142	95,211	96,670	96,670	96,670	92,977	91,901	90,778	89,759	1,096,514
AN	1963	87,464	82,860	81,599	90,703	96,670	96,670	96,670	96,670	93,369	92,307	91,188	90,173	1,096,345
AN	1940	82,115	75,990	70,689	84,757	96,670	96,670	96,670	96,670	95,817	94,707	93,554	92,067	1,076,378
AN	1965	81,355	75,643	85,307	96,670	94,255	95,265	96,670	96,670	95,688	94,582	93,433	92,067	1,097,606
AN	1996	87,464	82,860	82,238	93,809	96,670	96,670	96,670	96,670	96,027	95,046	93,937	92,067	1,110,131
AN	1922	87,464	82,860	82,860	86,836	96,670	96,670	96,670	96,670	95,770	94,634	93,469	92,067	1,102,641
AN	1975	87,464	78,983	74,780	76,355	95,879	96,670	96,670	96,670	95,897	94,934	93,888	92,067	1,080,258
AN	1974	87,464	82,860	90,452	94,575	92,067	96,641	96,670	96,670	96,000	95,074	93,953	92,067	1,114,493
AN	1978	64,871	64,431	64,876	87,464	94,738	96,670	96,670	96,670	96,002	94,904	93,753	92,067	1,043,117
AN	1993	71,133	70,692	72,397	90,293	96,670	96,670	96,670	96,670	95,842	94,708	93,542	92,067	1,067,356
AN	1951	84,462	84,011	93,538	95,873	96,670	96,583	96,670	96,670	95,813	94,692	93,539	92,067	1,120,589
AN	1943	87,464	82,860	82,053	95,407	96,670	96,670	96,670	96,670	95,765	94,626	93,458	92,067	1,110,381
AN	1927	87,464	84,759	82,860	87,464	96,670	96,621	96,670	96,670	95,922	94,745	93,564	92,067	1,105,476
AN	1937	87,464	82,860	82,807	83,505	93,481	96,670	96,670	96,670	95,587	94,433	93,260	92,067	1,095,475
AN	2000	87,464	78,940	73,641	78,133	93,920	96,670	96,670	96,670	96,029	94,962	93,802	92,067	1,078,969
AN	1921	87,464	82,860	87,202	95,375	96,670	96,670	96,670	96,499	95,604	94,410	93,219	92,067	1,114,712
AN	1999	87,464	82,860	82,860	87,464	96,670	96,670	96,670	96,670	96,027	95,110	94,099	92,067	1,104,632
AN	1923	87,464	82,860	92,109	93,344	93,469	94,072	96,670	96,490	95,660	94,465	93,274	92,067	1,111,945
N	1953	87,464	82,860	87,070	96,670	92,067	96,447	96,670	96,670	95,521	94,339	93,155	92,067	1,111,001
N	1928	87,464	82,860	82,556	83,892	86,450	96,670	96,670	96,665	95,561	94,367	93,176	92,067	1,088,397
N	1970	87,464	78,872	74,783	87,696	91,355	96,670	96,670	96,567	95,797	94,596	93,416	92,067	1,085,954
N	1984	87,464	83,414	93,265	87,869	88,224	89,516	90,991	91,957	91,312	90,156	88,995	87,960	1,071,124
N	1946	87,464	82,860	93,905	94,923	92,067	93,842	95,555	96,127	95,409	94,219	93,032	91,973	1,111,375
N	1926	73,918	73,463	71,798	72,485	92,067	92,992	96,670	96,229	95,375	94,164	92,965	91,900	1,044,027
N	1936	87,464	82,860	81,535	84,262	96,670	96,670	96,670	96,670	95,849	94,653	93,461	92,067	1,098,832
N	1945	87,464	79,038	74,668	76,350	92,067	96,670	96,670	96,670	95,785	94,593	93,403	92,067	1,075,446
N	1971	87,464	82,860	90,514	89,721	88,601	91,676	93,372	93,501	92,831	91,655	90,465	89,411	1,082,071
N	1935	86,196	78,292	73,528	87,464	87,579	91,803	96,670	96,670	95,465	94,272	93,081	92,022	1,073,403
N	1932	74,972	74,515	82,848	87,464	92,067	92,384	92,716	92,280	91,480	90,277	89,091	88,040	1,048,134
N	1979	87,464	82,860	82,752	87,439	93,078	96,670	96,670	96,619	95,754	94,547	93,343	92,067	1,099,264
N	1962	67,658	67,220	67,162	66,662	84,410	91,404	92,288	92,599	91,819	90,618	89,430	88,377	989,645
N	1949	82,078	81,633	81,928	81,767	82,409	96,670	96,670	96,670	95,711	94,510	93,318	92,067	1,075,431
N	1992	52,688	52,274	52,522	52,553	70,823	74,865	76,174	75,940	75,230	74,114	73,009	71,908	802,101
N	1981	87,464	82,860	81,718	87,464	87,054	96,670	96,670	96,456	95,583	94,322	93,094	92,013	1,091,368
BN	2001	87,464	82,860	81,312	82,317	92,042	96,670	96,670	96,386	95,467	94,240	93,034	91,966	1,090,427
BN	1930	84,562	77,571	72,279	75,344	78,048	90,318	90,852	90,486	89,523	88,315	87,129	86,080	1,010,509
BN	1954	87,464	82,860	82,860	86,591	92,067	96,670	96,670	96,670	95,888	94,668	93,466	92,067	1,097,943
BN	1968	87,464	82,860	81,891	87,464	90,595	93,756	95,150	95,383	94,558	93,332	92,128	91,064	1,085,645
BN	1959	87,464	82,860	82,860	86,885	92,405	93,283	93,644	93,327	92,464	91,237	90,038	88,976	1,075,442
BN	1925	71,599	65,676	62,107	62,775	76,208	75,999	77,518	78,860	77,996	76,843	75,712	74,711	876,003
BN	1944	87,464	82,860	82,860	83,153	91,779	96,670	96,670	96,670	95,858	94,631	93,427	92,067	1,094,110
BN	2002	87,464	82,860	82,860	86,728	87,635	92,305	93,052	92,792	91,959	90,735	89,529	88,457	1,066,377
BN	1950	87,464	78,716	73,494	80,600	88,001	88,824	89,723	89,583	88,718	87,509	86,327	85,282	1,024,342
BN	1966	87,464	82,860	82,860	86,519	91,019	92,018	91,649	91,155	90,299	89,084	87,894	86,842	1,059,663
BN	1955	87,464	78,876	77,969	84,722	85,791	87,008	88,016	88,280	87,455	86,261	85,092	84,055	1,020,988
BN	1957	87,464	82,860	82,853	83,238	92,022	93,527	94,571	96,203	95,362	94,132	92,927	91,859	1,087,017
BN	1934	80,126	79,665	82,860	87,464	91,576	92,308	92,103	91,399	90,496	89,267	88,074	87,018	1,052,486
BN	1985	87,191	81,614	77,948	78,014	80,359	84,232	84,188	83,987	83,220	82,058	80,920	79,806	983,354
BN	1991	48,470	48,076	47,942	47,286	46,321	56,646	57,574	57,261	56,527	55,502	54,495	53,416	829,876
BN	1929	87,464	82,860	82,860	84,853	86,248	89,268	90,246	89,748	88,861	87,635	86,444	85,392	1,041,878
BN	1964	87,464	82,860	82,860	87,341	86,086	86,287	86,648	86,436	85,567	84,374	83,208	82,115	1,022,807
D	1947	87,464	82,860	82,860	83,457	84,629	87,210	89,012	89,025	88,230	87,044	85,884	84,788	1,032,530
D	1994	87,464	82,860	82,860	82,766	89,698	89,902	90,188	90,160	89,237	88,013	86,826	85,775	1,046,349
D	1939	87,464	82,860	82,860	83,579	85,653	87,524	87,732	87,176	86,324	85,133	83,970	82,944	1,023,218
D	1948	84,055	82,860	81,748	81,329	80,827	82,268	86,034	87,128	86,271	85,071	83,917	82,893	1,004,409
D	1960	87,464	78,713	73,460	73,928	79,886	79,503	79,421	79,016	78,108	76,937	75,799	74,702	987,707
D	1972	87,464	82,860	82,860	83,487	84,893	84,245	83,912	83,154	82,195	80,992	79,813	78,739	984,654
D	1933	87,249	82,860	81,277	84,167	84,230	84,847	85,35						

A7.11 CALAVERAS RESERVOIR STORAGE

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)**Calaveras Reservoir Storage (Proj-2018) minus Calaveras Reservoir Storage (Base)**

2018 WSIP CSRE ACDD RH DT2300 minus

Base - Calaveras Constrained

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
W	1983	55,854	51,251	51,200	58,616	58,616	58,616	58,616	58,616	59,181	58,794	58,263	57,563	685,184
W	1998	56,287	51,251	50,835	57,986	58,616	58,616	58,616	58,616	58,627	58,276	58,602	58,309	684,636
W	1958	55,854	51,251	50,251	55,854	58,616	58,616	58,616	58,616	57,788	57,407	57,004	57,976	677,848
W	1941	55,854	51,251	51,251	52,209	58,616	58,616	58,616	58,610	57,797	57,415	56,888	57,123	674,244
W	1982	55,854	51,251	51,251	58,616	58,616	58,616	58,616	58,616	58,046	57,660	57,133	57,603	681,878
W	1995	53,833	46,733	41,961	58,616	57,646	58,616	58,616	58,616	59,623	59,246	58,716	58,309	670,530
W	1956	51,775	51,388	58,616	58,616	58,616	59,076	58,616	58,616	58,219	57,835	57,981	58,309	687,664
W	1952	55,854	51,251	51,200	58,616	58,616	58,616	58,616	58,616	58,950	58,561	58,081	58,309	685,285
W	1938	55,854	51,251	51,251	55,784	58,616	58,616	58,616	58,616	58,803	58,415	57,927	58,309	682,058
W	1997	55,854	53,170	58,616	58,616	57,649	63,352	62,803	62,153	61,717	61,302	60,748	60,032	716,012
W	1969	56,064	51,342	51,251	58,616	58,616	58,616	58,616	58,616	58,418	58,030	58,117	58,309	684,611
W	1973	48,946	51,251	50,943	58,616	58,616	58,616	58,616	58,616	58,130	57,744	57,776	58,309	676,178
W	1986	48,899	48,517	47,029	46,163	58,616	58,616	58,616	58,637	58,904	58,511	57,980	58,309	658,796
W	1980	55,854	47,416	45,616	52,690	58,616	58,616	58,616	58,616	58,241	57,856	57,963	58,309	668,410
W	1942	55,854	51,251	51,200	56,694	58,616	58,920	58,616	58,616	58,228	57,837	57,308	57,350	680,489
W	1967	56,438	53,024	51,251	56,087	57,157	58,616	58,616	58,616	57,424	57,037	56,510	56,001	676,777
AN	1963	55,854	51,251	49,989	52,649	58,616	58,907	58,616	58,616	57,804	57,418	56,890	56,415	673,025
AN	1940	52,095	46,047	40,683	48,930	58,616	58,616	58,616	58,616	58,855	58,463	57,932	58,309	655,777
AN	1965	52,174	46,138	47,252	58,616	57,670	63,655	58,701	58,616	57,867	57,481	57,527	58,309	674,007
AN	1996	55,854	51,251	50,629	55,755	58,616	58,616	58,616	58,616	58,984	58,594	58,202	58,309	682,041
AN	1922	56,293	51,745	51,251	55,226	58,616	58,616	58,616	58,632	58,899	58,500	57,966	58,309	682,668
AN	1975	55,854	47,373	43,171	44,746	57,824	58,616	58,616	58,616	58,869	58,483	58,134	58,309	658,612
AN	1974	55,854	51,658	52,398	56,520	59,119	58,587	58,616	58,616	58,941	58,558	58,201	58,309	685,378
AN	1978	35,811	35,445	34,416	49,409	56,684	58,616	58,616	58,616	60,417	60,014	59,473	58,309	625,827
AN	1993	39,899	39,529	40,788	52,239	58,616	58,616	58,616	58,616	59,752	59,354	58,813	58,309	643,147
AN	1951	53,433	52,401	55,484	57,819	58,616	58,528	58,616	58,616	57,996	57,610	57,633	58,309	685,061
AN	1943	55,854	51,251	50,444	57,352	58,616	58,616	58,616	58,616	57,962	57,577	57,556	58,309	680,769
AN	1927	55,854	53,149	51,251	55,854	58,616	60,073	58,616	58,616	58,228	57,834	57,709	58,309	684,109
AN	1937	55,854	51,304	51,197	51,895	55,426	58,616	58,616	58,616	58,653	58,259	57,726	58,309	674,472
AN	2000	55,854	47,330	42,032	46,523	55,865	58,616	58,616	58,616	58,242	57,855	57,896	58,309	655,753
AN	1921	55,854	51,251	51,200	57,321	58,616	64,533	63,549	62,940	62,510	62,085	61,526	60,711	712,095
AN	1999	55,854	51,251	51,251	55,854	58,616	60,169	58,616	58,616	58,033	57,653	58,193	58,309	682,414
AN	1923	55,854	51,251	54,055	55,290	55,415	62,880	59,871	59,215	58,786	58,388	57,854	58,309	687,168
N	1953	55,854	51,251	51,200	58,616	57,656	65,162	63,480	61,691	60,810	60,400	59,852	59,111	705,082
N	1928	55,854	51,292	50,946	52,282	54,840	58,616	58,616	58,611	58,192	57,801	57,431	58,309	672,790
N	1970	55,854	47,263	43,173	49,642	55,989	58,616	58,616	58,512	58,097	57,707	57,568	58,309	659,347
N	1984	55,854	51,805	55,210	54,446	56,787	57,907	57,407	56,829	56,420	56,034	55,508	54,816	669,023
N	1946	55,854	51,251	55,850	56,869	56,965	62,232	61,737	61,129	60,701	60,292	59,744	59,035	701,659
N	1926	42,308	41,935	40,234	40,875	54,013	61,460	58,616	58,175	57,752	57,361	57,150	58,142	628,021
N	1936	55,854	51,286	49,925	52,652	58,616	63,385	59,625	58,616	58,106	57,716	57,601	58,309	681,692
N	1945	55,854	47,429	43,058	44,740	54,013	60,758	58,616	58,616	58,029	57,640	57,538	58,309	654,600
N	1971	55,854	51,251	52,459	51,881	57,049	60,558	60,063	59,438	59,016	58,614	58,073	57,369	681,625
N	1935	56,102	48,124	42,936	51,082	55,969	60,193	58,616	58,616	59,434	59,034	58,496	58,264	666,866
N	1932	45,421	45,040	50,151	55,854	55,745	60,774	60,219	59,568	58,858	58,451	57,907	57,198	665,186
N	1979	55,854	51,251	51,142	55,829	55,243	59,513	58,616	58,565	58,146	57,756	57,532	58,309	677,756
N	1962	37,386	37,019	36,681	35,817	46,355	54,107	54,234	54,544	53,870	53,500	53,524	54,619	571,655
N	1949	50,468	50,083	50,318	50,157	50,799	58,616	58,616	58,616	57,971	57,581	57,461	58,309	658,997
N	1992	21,095	20,757	20,912	20,943	32,769	40,429	39,967	39,399	38,782	38,100	37,435	38,426	389,014
N	1981	55,854	51,264	50,109	53,579	56,625	63,760	61,877	61,232	60,798	60,385	59,837	59,127	694,448
BN	2001	55,854	51,251	49,702	50,708	56,456	60,914	58,960	58,331	57,914	57,522	57,247	58,208	673,065
BN	1930	53,757	46,845	41,491	43,735	46,438	54,484	53,954	53,340	52,961	52,594	52,088	52,322	604,009
BN	1954	55,854	51,251	51,251	54,981	60,241	65,061	62,396	61,536	61,104	60,689	60,140	59,096	703,599
BN	1968	55,854	51,251	50,282	54,654	59,386	62,717	62,205	61,579	61,141	60,723	60,171	59,456	699,419
BN	1959	55,854	51,251	51,251	55,275	54,646	62,143	61,586	60,932	60,494	60,076	59,520	58,802	691,830
BN	1925	43,387	37,536	32,370	31,528	38,697	44,390	43,937	43,351	42,995	42,677	42,219	41,583	484,670
BN	1944	55,854	51,251	51,251	51,543	58,467	64,413	62,553	61,683	61,250	60,834	60,284	59,278	698,661
BN	2002	55,854	51,251	51,251	55,225	57,332	61,099	60,563	59,917	59,485	59,075	58,527	57,815	687,392
BN	1950	55,854	47,175	41,885	48,991	55,877	57,215	56,695	56,070	55,655	55,266	54,740	54,047	639,469
BN	1966	55,854	51,251	51,251	54,978	59,782	60,409	59,823	59,169	58,737	58,326	57,777	57,064	684,419
BN	1955	55,854	47,266	46,360	53,113	55,903	55,483	54,970	54,370	53,963	53,584	53,068	52,383	636,316
BN	1957	55,854	51,251	51,243	51,628	58,087	62,137	61,611	61,049	60,615	60,203	59,656	58,947	692,280
BN	1934	49,533	49,148	51,251	55,854	59,966	60,698	60,118	59,454	59,017	58,215	57,435	56,726	677,417
BN	1985	55,581	50,004	46,338	46,404	48,749	52,622	52,068	51,450	51,054	50,687	50,180	49,502	604,641
BN	1991	18,354	18,061	17,717	16,865	15,739	23,687	23						

Appendix D.2

SFPUC Memorandum Detailing Revised 2018 HHLSTM Model Run Performed for the Calaveras Dam Replacement Project

Memorandum

To: Ellen Levin, Deputy Manager, Water Enterprise, 1145 Market Street 4th Floor

Subject: 2018 WSIP Model Run with Crystal Springs Restricted and Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases

From: David Cameron, Water Operations Analyst, Water Enterprise, 1145 Market Street 4th Floor, and Daniel B. Steiner, Consulting Engineer.

Date: April 29, 2009. (Legend of Figures and Tables corrected August 27, 2009).

1. Introduction and Assumptions

The operation of the Alameda Creek Diversion Dam and Calaveras Reservoir has been evaluated previously within the context of the San Francisco Public Utilities Commission's Water Supply Improvement Program (WSIP) studies undertaken in the Program Environmental Impact Report (PEIR). Those evaluations included modeled operations of the dam and reservoir under several conditions:

- The Base ("existing") Setting that assumed the existing Regional Water System (system) configuration and the average annual system demand of 265 MGD. Calaveras Reservoir had a maximum operating storage of 12.4 BG (Department of Safety of Dams, DSOD, restrictions) with no required in-stream releases to Alameda Creek. Also in this Setting, the Crystal Springs Reservoir maximum operating storage was modeled as 18.52 BG.
- The adopted Phased WSIP Variant ("2018 WSIP") assuming future WSIP improvements to the system with the customer purchase request limited by the terms of the existing Master Water Sales Agreement through 2018, assumed to amount to net 265 MGD of system demand after an offset of 10 MGD of recycled water, groundwater, and conservation projects in San Francisco. Calaveras Reservoir was restored to full operating capacity (31.5 BG) with the California Department of Fish and Game Memorandum of Understanding (MOU) in-stream flow objectives being supplemented from that reservoir and recaptured for treatment at Sunol Valley Water Treatment Plant (SVWTP). The Crystal Springs Reservoir maximum operating storage was modeled as 22.15 BG.

Since the completion of the explicit PEIR modeling studies, some components of the WSIP configuration have been refined. This memorandum, describes the changed construct of the refined modeling Setting, and the revised modeled operation of the Alameda Creek system. The principle features of this revised Setting are:

- Consistent with the earlier 2018 WSIP Setting, the annual average system demand amounts to a net 265 MGD after an offset of 10 MGD of recycled water, groundwater, and conservation projects in San Francisco.

- The maximum Crystal Springs Reservoir operating storage is restricted to 20.28 BG.
- The in-stream flow requirement for Alameda Creek (compliance at the confluence of the Alameda and Calaveras Creeks) remains consistent with the MOU (Table 1-1). However, in this revised Setting, the primary source of water for compliance at the confluence is the Alameda Creek Diversion Dam (ACDD), when available, instead of Calaveras reservoir. Releases are made from Calaveras Reservoir to supplement water released at ACDD if necessary.
- The upper limit for recapture of releases explicitly made at ACDD and Calaveras Reservoir for MOU in-stream releases is 20 cfs. The recaptured water is sent for treatment at SVWTP.¹

The results of the revised 2018 WSIP Setting described in this memorandum focus upon the operation of ACDD and Calaveras Reservoir, and the resulting stream flow hydrology below these facilities. The operation of ACDD and Calaveras Reservoir are simulated by the use of the Hetch Hetchy/Local Simulation Model (HH/LSM), which is a system-wide monthly time-step operations planning tool used by the SFPUC. HH/LSM uses a scenario-specific system configuration and system water demand over an 82-year historic hydrology (1921–2002) to project operations that might result if that 82-year hydrology recurs. The utility of model simulations is the comparison of results between different scenarios of system configuration, water demand and system operation. This memorandum demonstrates the comparison between the revised 2018 WSIP Setting and the Base Setting.

2. Analysis Results

2.1 Alameda Creek Diversions to Calaveras Reservoir

Figure 2-1 illustrates the amount of water diverted to Calaveras Reservoir from ACDD for the revised 2018 WSIP Setting and the Base Setting. These average monthly results are grouped by month and shown for each Water Year Type. The Water Year Type is defined by a rank-ordering of the combined local reservoir runoff as described in Appendix O of the PEIR. The differences between the revised 2018 WSIP Setting and the Base Setting are also shown. A negative value for a difference indicates that the Base Setting value is larger than the corresponding revised 2018 WSIP Setting value. Table 2-1 provides the same information in tabular form. Tables 2-2 and 2-3 contain the chronological monthly results for the Base and revised 2018 WSIP Settings, respectively, and Table 2-4 provides a difference calculation between the two settings. These results indicate the following:

- **Annual average.** For the 82 years of simulation, Calaveras reservoir receives an annual average 212 MG (0.6 MGD) less water in the revised 2018 WSIP Setting than in the Base Setting (i.e., an annual average of 1,103 MG in the revised 2018 WSIP Setting compared with 1,316 MG of the Base; this is equivalent to about 3 MGD compared with 3.6 MGD). This overall difference in the annual average can be explained by the absence of MOU in-stream flow requirements in the Base Setting

¹ In the earlier WSIP studies the recapture potential was effectively unconstrained, with the maximum supplemental release for MOU compliance equal to 20 cfs. The maximum supplemental release for MOU compliance continues to remain as an average monthly 20 cfs in the revised setting; however, the recapture facility has been configured to have a maximum capacity of 20 cfs.

and the primary use of water available at ACDD to comply with the MOU requirements in the revised 2018 WSIP Setting.

- **Monthly analysis.** As seen in the results illustrating differences between the two settings (Figure 2.1, Table 2.1, and Table 2-4) inflow to Calaveras Reservoir from ACDD is smaller in the revised 2018 WSIP Setting than in the Base Setting very consistently for all year types for the months of March through November. In general, this result can be attributed to the use of water available at ACDD for MOU compliance in the revised 2018 WSIP Setting. By releasing water at ACDD for MOU compliance there would be less water available for diversion to Calaveras Reservoir.

For the months of December through February the magnitude of the difference between the two Settings is dependent upon Water Year type. For Wet Years, the revised 2018 WSIP Setting has a larger inflow to Calaveras from ACDD (than the Base Setting) in the month of January. For Above Normal Years and Normal Years, the revised 2018 WSIP Setting has a larger inflow to Calaveras from ACDD (than the Base Setting) in the months of December through February. However, for Below Normal and Dry Years, the Base has a larger inflow to Calaveras from ACDD than the revised 2018 WSIP Setting.

These mixed results are explained as follows. There are two main differences in the operations of Calaveras Reservoir between the Base and revised 2018 WSIP Settings: (1) the storage capacity of the reservoir (larger in the revised 2018 WSIP Setting than in the Base Setting), and, (2) the use of flow available at ACDD for MOU releases.

During winter months associated with the Normal through Wet Years year types, the increased storage capacity of Calaveras reservoir in the revised 2018 WSIP Setting allows more opportunities for water to be stored in the reservoir (after cyclic reservoir drawdown and accounting for MOU releases) than in the Base Setting. For example, in the Base Setting, the diversion to Calaveras Reservoir from ACDD would be shut off if the storage in Calaveras reached the amount associated with the DSOD restriction. Since the DSOD restriction does not apply in the revised 2018 WSIP Setting, then Calaveras can continue to receive water from ACDD (assuming that there is sufficient water available from ACDD after accounting for the MOU releases).

In the Below Normal and Dry year types, there is less water available for diversion from ACDD to Calaveras Reservoir in the revised 2018 WSIP Setting (compared to the Base Setting) because of the MOU release from ACDD. As seen in Table 2-3, during the June through October period (except during a rare late spring precipitation event) no flow is modeled to be diverted to Calaveras Reservoir in the revised 2018 WSIP Setting as all available flow at ACDD is passed for the MOU.

2.2 Alameda Creek Release from ACDD

Commensurate with differences in diversions to Calaveras Reservoir from ACDD between the Base and revised 2018 WSIP settings, there would be changes in releases to Alameda Creek from ACDD between the two settings. The releases to Alameda Creek from ACDD and the difference in releases from ACDD for the two settings are shown in Figure 2-2 and Table 2-5, as reported by month, by year type. Tables 2-6 and 2-7 contain the chronological monthly results

for the Base and revised 2018 WSIP Settings, respectively, and Table 2-8 provides a difference calculation between the two settings.

The results of the comparison between the two settings for releases to Alameda Creek from ACDD are equal and opposite of the results for the diversions to Calaveras Reservoir from ACDD. More flow past ACDD in the revised 2018 WSIP Setting occurs most of the time due to the use of available flow at ACDD for MOU compliance purposes (as compared to the Base Setting when there are no releases for the MOU). In almost all months there would be flow released to Alameda Creek from ACDD. The exception would be during periods when there may not be any inflow occurring at ACDD. There will be occasions, during wetter years, when the flow past ACDD is less in the revised 2018 WSIP Setting as compared to the Base Setting due to the reasons described previously regarding the ability to store additional water in Calaveras Reservoir when the DSOD constraints are eliminated.

Flow in Alameda Creek below ACDD will increase above the values described above as the point of interest along the creek moves downstream towards the confluence with Calaveras Creek. Unregulated watershed runoff will add to the flows released from ACDD.

2.3 Releases to Calaveras Creek from Calaveras Dam

Releases from Calaveras Dam to Calaveras Creek consist of spills (controlled releases at the time of near-full reservoir condition) and supplemental releases for in-stream flow requirements. In the Base Setting there is no required flow downstream of the dam and thus releases only occur during spill conditions. In the revised 2018 WSIP Setting spills also occur, but additionally supplemental releases from Calaveras Reservoir are at times needed to supplement the releases made from ACDD for MOU compliance.

The releases to Calaveras Creek from Calaveras Dam and the difference in releases from dam for the two settings are shown in Figure 2-3 and Table 2-9, as reported by month, by year type. Tables 2-10 and 2-11 contain the chronological monthly results for the Base and revised 2018 WSIP Settings, respectively, and Table 2-12 provides a difference calculation between the two settings.

The results demonstrate the need for releases from Calaveras Dam during the June through November period for MOU compliance. Although the initial call for MOU releases occurs from ACDD, during this period of time little flow occurs from upstream Alameda Creek. The majority of MOU compliance is met with Calaveras Dam releases. In the Base Setting, water is released from the dam to Calaveras Creek only during winter-time spill conditions.

2.4 Flow below the Alameda Creek/Calaveras Creek Confluence

Flow at the confluence of Alameda Creek and Calaveras Creek consists of the components of flows described above: (1) releases made to Alameda Creek from ACDD, (2) releases made to Calaveras Creek from Calaveras Dam, and (3) unregulated watershed runoff between ACDD and the confluence. Figure 2-4 and Table 2-13 illustrate the total flow in Alameda Creek at the MOU compliance point, as calculated from all three sources under both the Base and revised 2018 WSIP Settings. Tables 2-14 and 2-15 contain the chronological monthly results for the Base and revised 2018 WSIP Settings, respectively, and Table 2-16 provides a difference calculation between the two settings.

The results illustrate that the direction of the differences for this location is the same as that of the change in ACDD releases to Alameda Creek and the change in Calaveras Reservoir releases to Calaveras Creek. The total amount of water in Alameda Creek may be greater than the minimum amount of water specified under the MOU due to unregulated watershed runoff and releases of flow from ACDD and Calaveras Dam that exceed MOU requirements.

Average monthly unregulated watershed runoff between ACDD and the confluence is summarized in Table 2-17 by water year type, and listed chronologically in Table 2-18.

2.5 Recapture of Alameda Creek In-Stream Releases at SVWTP

For the 82 years of simulation, Tables 2-19 and 2-20 summarize the monthly quantities of MOU released water recaptured for treatment at SVWTP under the revised 2018 WSIP Setting. No MOU instream flow requirements occur in the Base Setting; therefore, no recapture occurs in the Base Setting. The quantity of water recaptured is sometimes less than the volume of water required at the compliance point under the MOU. This circumstance is explained by the working assumption that only water explicitly released from ACDD and Calaveras Dam from MOU compliance is allowed to be recaptured. Unregulated watershed runoff contributing to MOU compliance is not recaptured.

2.6 Flow Downstream of the Recapture Point

As described above, a flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the revised WSIP 2018 Setting. This facility is assumed to recapture flows explicitly released from ACDD and Calaveras Dam in the representation of the MOU. The effect of the recapture is a reduction in the flow that occurs below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made from ACDD and Calaveras Reservoir. Flows below this diversion have been estimated and noted as the flow above the Alameda and San Antonio Creek confluence. Tables 2-21 to 2-24 illustrate the flow at this location for the revised WSIP 2018 and Base Settings (and the difference in flows between those two Settings). The flows identified at this location indicate flow occurring below the confluence of Alameda and Calaveras Creeks (described above), with the addition of estimated unregulated stream accretions between the Alameda-Calaveras Creek confluence and the Alameda-San Antonio Creek confluence minus the water assumed to be recaptured (diverted) by the SFPUC from the creek.

2.7 Calaveras Storage

Calaveras Reservoir storage values simulated under the 82 years of input hydrology for both the Base and revised 2018 WSIP Settings are summarized in Tables 2-25 to 2-27. In considering the differences in storage between the two settings, it must be recognized that, in the Base Setting the reservoir is operated under the restricted storage constraint as required by the DSOD while in the revised 2018 WSIP Setting the constraint is removed. In each setting the reservoir will typically cycle within a range based on local watershed runoff characteristics and overall system operation. In the revised 2018 WSIP Setting that range would increase.

Table 1-1
Alameda Creek In-Stream Flow Required by the MOU (Incorporating the Proposed Ramping Schedule of the 1997 MOU)

Month	Volume (MG)	Equivalent Flow (cfs)
July	140	7
August	140	7
September	136	7
October	140	7
November	97	5
December	100	5
January	275	14
February	362	20
March	349	17
April	144	7
May	140	7
June	136	7

Figure 2-1
Calaveras Reservoir inflow from ACDD by Water Year Type

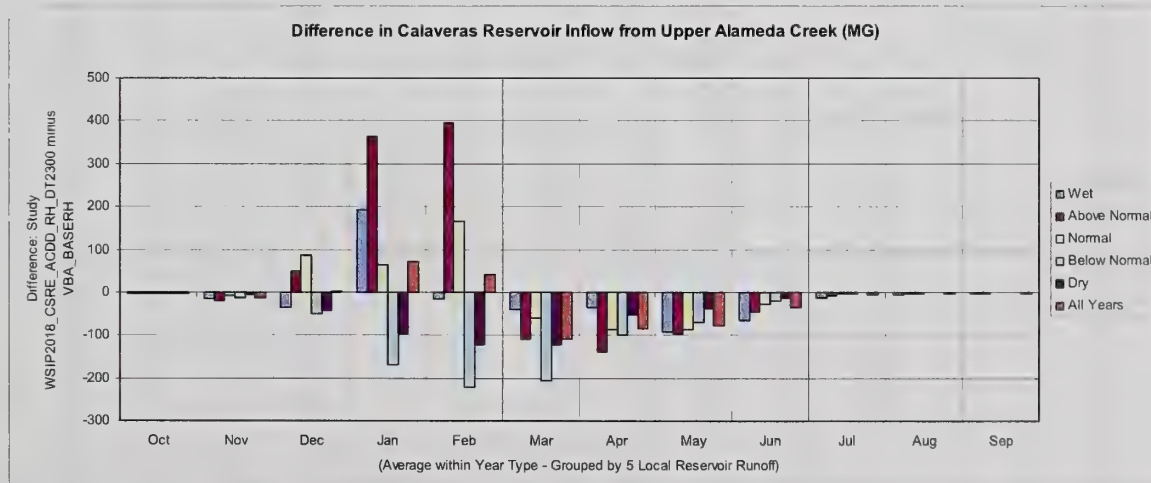
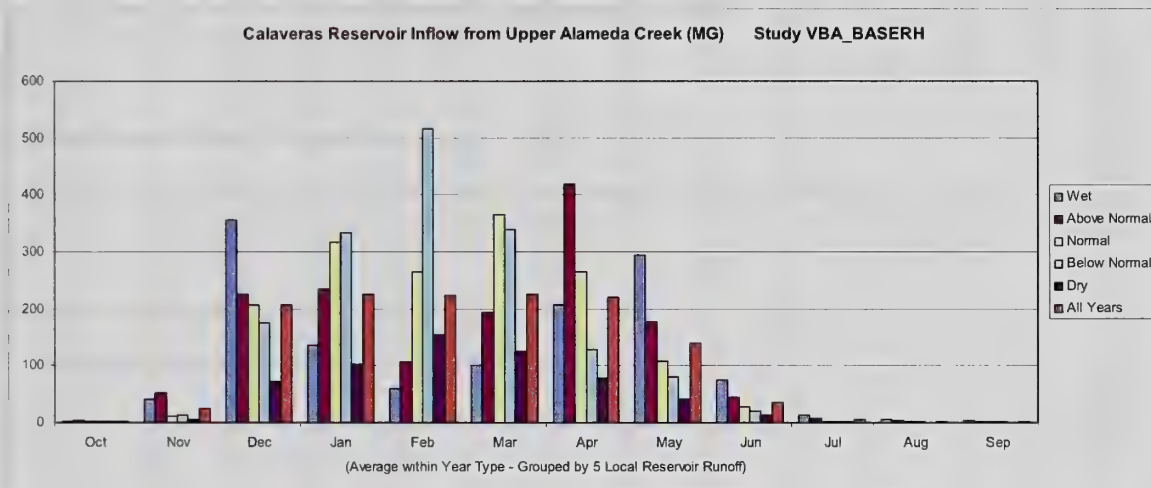
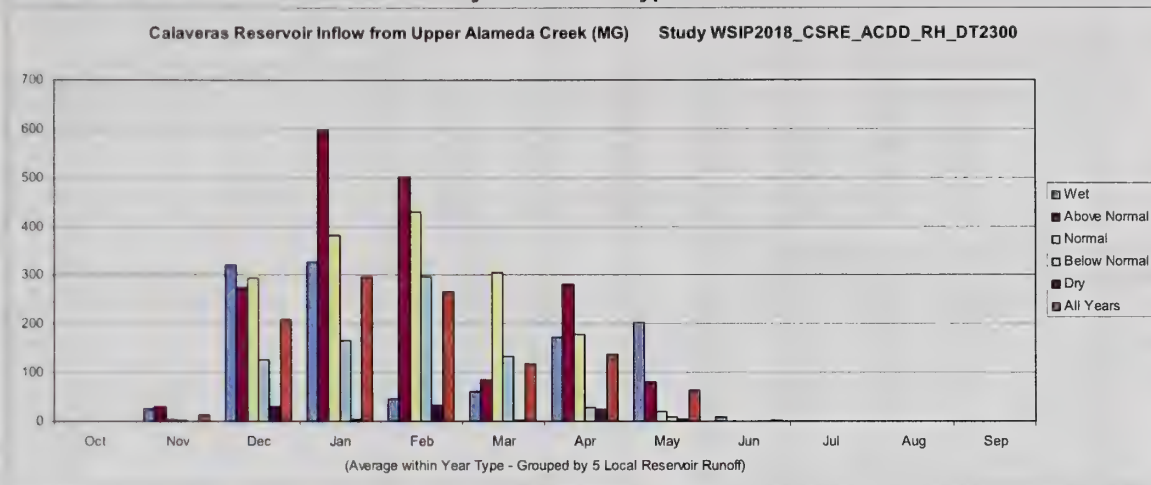


Table 2-1
Calaveras Reservoir inflow from ACDD by Water Year Type

Calaveras Reservoir Inflow from Upper Alameda Creek (MG)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

	WSIP2018_CSRE_ACDD_RH_DT2300												WY Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Wet	0	26	321	328	46	61	173	202	9	0	0	0	1,166
Above Normal	0	31	275	598	502	86	280	80	0	0	0	0	1,853
Normal	0	4	294	382	430	305	179	20	0	0	0	0	1,614
Below Normal	0	2	126	165	297	133	28	10	0	0	0	0	762
Dry	0	0	30	5	32	2	25	3	0	0	0	0	96
All Years	0	13	209	298	265	117	137	63	2	0	0	0	1,103

Calaveras Reservoir Inflow from Upper Alameda Creek (MG)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

	VBA_BASERH												WY Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Wet	2	42	356	135	60	100	208	295	74	14	6	4	1,296
Above Normal	4	52	225	235	106	194	418	177	45	8	4	2	1,469
Normal	2	11	207	317	265	366	265	108	28	3	2	1	1,575
Below Normal	2	14	175	334	517	340	129	80	21	2	1	1	1,615
Dry	2	5	72	102	154	125	78	41	12	1	1	1	594
All Years	3	25	207	226	223	226	221	140	36	5	3	2	1,316

Difference in Calaveras Reservoir Inflow from Upper Alameda Creek (MG)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

	WSIP2018_CSRE_ACDD_RH_DT2300 minus VBA_BASERH												WY Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Wet	-2	-16	-35	192	-14	-39	-35	-93	-65	-14	-6	-4	-130
Above Normal	-4	-21	50	363	397	-108	-138	-96	-45	-8	-4	-2	383
Normal	-2	-7	87	65	165	-61	-86	-88	-28	-3	-2	-1	39
Below Normal	-2	-12	-49	-168	-220	-206	-100	-71	-21	-2	-1	-1	-853
Dry	-2	-5	-43	-98	-122	-123	-53	-37	-12	-1	-1	-1	-498
All Years	-3	-12	2	72	42	-109	-83	-77	-34	-5	-3	-2	-212

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

Table 2-2 – Calaveras Reservoir inflow from ACDD (MG) (Base Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	1	65	958	0	67	228	98	63	19	3	2	1	1,505
1922	2	2	472	382	0	0	524	145	34	4	2	1	1,568
1923	2	69	62	241	370	152	477	68	7	3	2	1	1,453
1924	2	0	0	0	0	1	3	0	0	0	0	0	6
1925	0	1	137	129	1,021	83	180	186	5	2	1	1	1,746
1926	1	1	3	134	0	180	510	47	7	2	1	1	887
1927	1	361	161	424	0	550	677	84	8	3	2	1	2,272
1928	2	2	191	176	269	0	354	81	3	3	2	1	1,084
1929	2	2	312	239	242	346	146	41	19	1	1	1	1,352
1930	1	1	11	314	314	342	106	49	11	2	1	1	1,153
1931	2	2	20	140	60	72	24	18	10	1	1	1	351
1932	1	1	682	569	1,013	127	90	44	26	2	1	1	2,557
1933	2	2	16	310	106	153	104	70	14	1	1	1	780
1934	1	1	355	393	488	160	48	23	18	1	1	1	1,490
1935	1	5	41	1,182	109	435	941	200	34	3	2	1	2,954
1936	2	2	42	292	0	323	326	120	34	3	2	1	1,147
1937	2	2	30	131	86	0	615	168	41	4	2	1	1,082
1938	2	3	573	705	0	0	572	204	58	6	3	2	2,128
1939	6	11	197	138	298	259	83	35	21	2	1	1	1,052
1940	1	1	11	1,166	0	0	208	168	48	5	2	2	1,612
1941	2	4	614	894	0	0	0	498	67	7	4	2	2,092
1942	4	8	688	0	0	380	0	415	52	5	3	2	1,557
1943	3	31	129	0	0	0	357	160	45	4	2	2	733
1944	3	6	53	100	787	614	172	100	27	2	1	1	1,866
1945	1	9	86	210	0	541	221	169	35	3	2	1	1,278
1946	2	11	110	340	401	243	199	125	34	3	2	1	1,470
1947	3	21	127	130	230	321	215	83	27	2	2	1	1,162
1948	2	3	45	43	60	218	363	165	20	2	1	1	923
1949	1	2	58	63	163	0	205	143	33	3	2	1	674
1950	1	1	34	637	627	167	134	67	20	2	1	1	1,692
1951	1	206	0	68	262	98	212	176	52	5	3	2	1,085
1952	2	5	860	0	0	0	551	175	59	6	3	2	1,663
1953	4	5	1,006	0	343	448	174	174	36	3	2	1	2,196
1954	2	14	35	382	619	580	240	100	30	2	1	1	2,006
1955	1	5	397	613	186	199	143	99	23	2	1	1	1,670
1956	1	2	0	0	0	673	244	132	57	6	3	2	1,120
1957	5	5	34	108	842	224	148	210	25	2	1	1	1,605
1958	1	4	117	519	0	0	0	409	68	7	4	2	1,131
1959	4	4	39	397	1,152	173	93	55	22	2	1	1	1,943
1960	1	1	15	113	434	72	56	44	13	1	1	1	752
1961	1	9	35	82	63	191	43	32	13	1	1	1	472
1962	1	1	29	35	74	651	133	103	28	2	1	1	1,059
1963	9	3	102	0	0	685	0	638	56	5	3	2	1,503
1964	4	43	92	571	114	129	100	66	21	2	1	1	1,144
1965	1	10	374	0	520	182	1,059	176	49	5	2	2	2,380
1966	3	43	458	389	522	193	37	42	23	2	1	1	1,714
1967	1	9	544	0	183	0	0	677	53	5	3	2	1,477
1968	3	5	84	759	443	353	175	98	26	2	1	1	1,950
1969	1	6	265	0	0	0	385	127	60	5	2	2	853
1970	4	5	109	0	421	339	139	72	30	3	2	1	1,125
1971	2	42	838	712	127	355	203	92	38	3	1	1	2,414
1972	2	3	363	127	236	52	37	17	11	1	0	0	849
1973	1	113	280	0	0	0	324	121	49	5	3	2	898
1974	7	79	737	0	229	471	0	199	76	9	3	1	1,811
1975	4	7	100	201	0	0	538	189	66	8	5	4	1,122
1976	6	7	35	32	36	88	36	16	7	1	1	1	266
1977	2	3	12	55	23	49	25	18	7	1	0	0	195
1978	0	1	126	0	0	0	671	159	61	5	2	2	1,027
1979	2	4	26	416	929	660	215	76	23	2	1	1	2,355
1980	3	8	308	0	0	334	316	125	51	6	3	2	1,156
1981	2	3	36	509	199	915	172	63	22	1	1	1	1,924
1982	1	55	406	0	0	0	0	472	65	6	3	2	1,010
1983	3	32	497	0	0	0	0	224	96	10	5	3	870
1984	8	86	0	355	199	221	194	167	42	3	2	1	1,278
1985	3	85	189	93	167	468	68	70	30	2	2	1	1,178
1986	1	4	50	48	0	0	437	144	53	5	3	1	746
1987	2	2	28	48	82	133	45	15	10	1	1	1	368
1988	1	2	99	190	43	31	39	18	9	1	1	1	435
1989	1	1	43	47	42	158	42	12	9	1	1	1	358
1990	1	10	35	113	133	76	38	28	11	1	1	1	448
1991	1	2	23	21	20	752	130	44	19	2	1	1	1,016
1992	1	1	52	76	0	417	163	56	28	2	1	1	798
1993	1	1	185	0	0	212	255	167	44	4	2	2	873
1994	3	4	89	69	621	120	87	77	16	1	1	1	1,089
1995	0	17	136	0	302	0	384	547	190	55	11	7	1,649
1996	2	3	274	36	0	0	364	160	53	24	10	4	930
1997	9	325	0	0	482	215	108	55	25	11	6	3	1,239
1998	4	74	362	0	0	0	0	390	182	75	36	24	1,147
1999	17	29	94	911	266	722	875	192	77	25	13	9	3,230
2000	6	12	15	437	0	0	183	89	35	12	4	2	795
2001	3	5	12	127	1,019	547	154	54	12	3	2	1	1,939
2002	1	10	705	399	227	442	115	60	25	5	2	0	1,991
Avg (21-02)	3	25	207	226	223	226	221	140	36	5	3	2	1,316
Max (21-02)	17	361	1,006	1,182	1,152	915	1,059	677	190	75	36	24	3,230
Min (21-02)	0	0	0	0	0	0	0	0	0	0	0	0	6

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

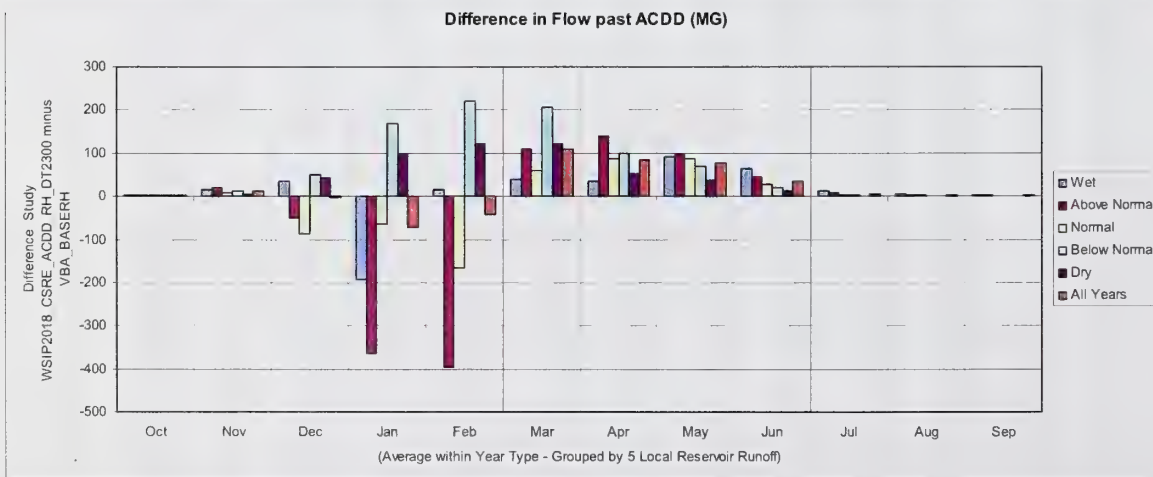
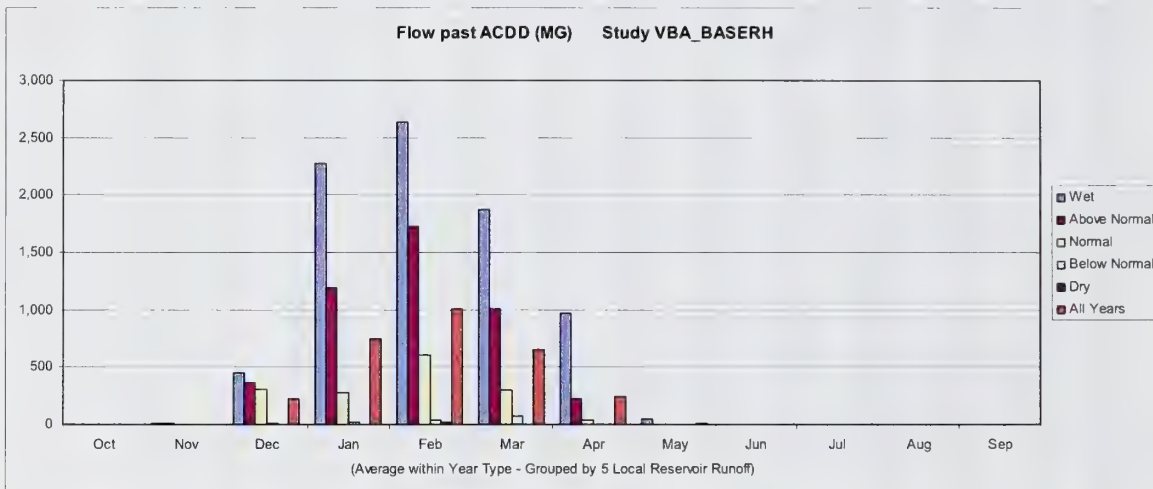
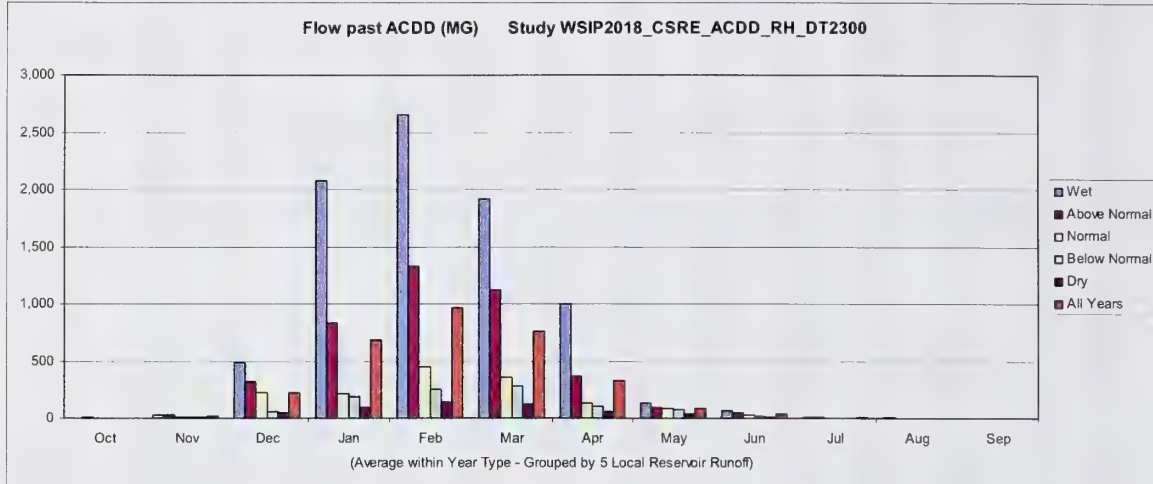
Table 2-3 – Calaveras Reservoir inflow from ACDD (MG) (Revised 2018 WSIP Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	958	834	508	0	0	0	0	0	0	0	2,300
1922	0	0	469	187	0	0	453	20	0	0	0	0	1,128
1923	0	0	992	657	429	0	370	0	0	0	0	0	2,448
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	49	0	849	0	75	57	0	0	0	0	1,029
1926	0	0	0	0	969	0	452	0	0	0	0	0	1,421
1927	0	289	88	214	0	290	572	0	0	0	0	0	1,453
1928	0	0	122	0	0	0	404	0	0	0	0	0	526
1929	0	0	225	0	0	35	8	0	0	0	0	0	267
1930	0	0	0	95	0	202	0	0	0	0	0	0	297
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	682	376	809	0	0	0	0	0	0	0	1,867
1933	0	0	0	72	0	0	0	0	0	0	0	0	72
1934	0	0	301	184	194	0	0	0	0	0	0	0	679
1935	0	0	0	1,090	0	163	941	98	0	0	0	0	2,292
1936	0	0	0	52	732	34	244	3	0	0	0	0	1,064
1937	0	0	0	0	1,255	0	578	60	0	0	0	0	1,892
1938	0	0	569	535	0	0	622	103	0	0	0	0	1,829
1939	0	0	119	0	0	0	0	0	0	0	0	0	119
1940	0	0	0	1,075	0	0	258	60	0	0	0	0	1,394
1941	0	0	603	1,220	0	0	0	446	0	0	0	0	2,269
1942	0	0	688	0	0	165	0	349	0	0	0	0	1,202
1943	0	0	44	0	316	0	278	50	0	0	0	0	687
1944	0	0	0	0	541	374	61	0	0	0	0	0	976
1945	0	0	0	0	1,366	286	120	61	0	0	0	0	1,832
1946	0	0	1,625	686	92	0	94	9	0	0	0	0	2,506
1947	0	0	41	0	0	28	110	0	0	0	0	0	178
1948	0	0	0	0	0	0	285	56	0	0	0	0	340
1949	0	0	0	0	0	1,745	101	30	0	0	0	0	1,875
1950	0	0	0	454	368	0	17	0	0	0	0	0	839
1951	0	206	0	843	541	0	105	66	0	0	0	0	1,760
1952	0	0	860	0	0	0	504	69	0	0	0	0	1,432
1953	0	0	1,006	1,268	25	178	64	67	0	0	0	0	2,607
1954	0	0	0	156	355	329	142	0	0	0	0	0	982
1955	0	0	349	426	0	0	27	0	0	0	0	0	802
1956	0	0	0	0	0	440	148	17	0	0	0	0	604
1957	0	0	0	0	604	0	33	109	0	0	0	0	745
1958	0	0	31	334	0	0	0	343	0	0	0	0	708
1959	0	0	0	174	966	0	0	0	0	0	0	0	1,140
1960	0	0	0	0	160	0	0	0	0	0	0	0	160
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	1,029	414	16	0	0	0	0	0	1,459
1963	0	0	14	709	0	454	0	609	0	0	0	0	1,786
1964	0	0	1	381	0	0	0	0	0	0	0	0	382
1965	0	0	753	0	231	0	0	70	0	0	0	0	1,054
1966	0	0	415	160	227	0	0	0	0	0	0	0	802
1967	0	0	521	546	550	0	0	653	0	0	0	0	2,270
1968	0	0	0	607	141	68	65	0	0	0	0	0	881
1969	0	0	196	0	0	0	312	12	0	0	0	0	519
1970	0	0	21	1,384	116	707	23	0	0	0	0	0	2,250
1971	0	0	1,248	537	0	69	97	0	0	0	0	0	1,951
1972	0	0	309	0	0	0	0	0	0	0	0	0	309
1973	0	100	211	1,514	0	0	239	3	0	0	0	0	2,066
1974	0	33	995	0	0	0	0	96	0	0	0	0	1,124
1975	0	0	11	0	1,684	0	588	85	0	0	0	0	2,368
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	41	1,353	956	0	643	50	0	0	0	0	3,042
1979	0	0	0	204	757	424	113	0	0	0	0	0	1,498
1980	0	0	246	1,095	0	367	232	9	0	0	0	0	1,948
1981	0	0	0	390	0	719	62	0	0	0	0	0	1,171
1982	0	0	375	0	0	0	0	415	0	0	0	0	790
1983	0	0	497	0	0	0	0	0	0	0	0	0	497
1984	0	62	0	120	0	0	84	56	0	0	0	0	322
1985	0	36	107	0	0	189	0	0	0	0	0	0	332
1986	0	0	0	0	0	0	372	32	0	0	0	0	403
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	10	0	0	0	0	0	0	0	0	0	10
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	563	12	0	0	0	0	0	575
1992	0	0	0	0	988	143	51	0	0	0	0	0	1,182
1993	0	0	106	1,629	0	245	161	59	0	0	0	0	2,199
1994	0	0	0	0	354	0	0	0	0	0	0	0	354
1995	0	0	42	0	5	0	337	456	72	0	0	0	911
1996	0	0	199	1,720	0	0	268	53	0	0	0	0	2,239
1997	0	312	0	0	186	0	0	0	0	0	0	0	498
1998	0	0	296	0	0	0	0	328	78	0	0	0	702
1999	0	0	8	720	1,186	467	421	92	0	0	0	0	2,894
2000	0	0	0	220	1,437	0	74	0	0	0	0	0	1,731
2001	0	0	0	0	801	331	47	0	0	0	0	0	1,179
2002	0	0	690	173	0	177	0	0	0	0	0	0	1,040
Avg (21-02)	0	13	209	298	265	117	137	63	2	0	0	0	1,103
Max (21-02)	0	312	1,625	1,720	1,684	1,745	941	653	78	0	0	0	3,042
Min (21-02)	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2-4 – Difference in Calaveras Reservoir inflow from ACDD (MG) (Revised WSIP 2018 minus Base Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	-1	-65	0	834	441	-228	-98	-63	-19	-3	-2	-1	795
1922	-2	-2	-3	-195	0	0	-71	-125	-34	-4	-2	-1	-440
1923	-2	-69	930	416	59	-152	-107	-68	-7	-3	-2	-1	994
1924	-2	0	0	0	0	-1	-3	0	0	0	0	0	-6
1925	0	-1	-88	-129	-172	-83	-105	-129	-5	-2	-1	-1	-717
1926	-1	-1	-3	-134	969	-180	-58	-47	-7	-2	-1	-1	534
1927	-1	-72	-73	-210	0	-260	-105	-84	-8	-3	-2	-1	-819
1928	-2	-2	-69	-176	-269	0	51	-81	-3	-3	-2	-1	-557
1929	-2	-2	-87	-239	-242	-311	-138	-41	-19	-1	-1	-1	-1,085
1930	-1	-1	-11	-219	-314	-140	-106	-49	-11	-2	-1	-1	-856
1931	-2	-2	-20	-140	-60	-72	-24	-18	-10	-1	-1	-1	-351
1932	-1	-1	0	-193	-204	-127	-90	-44	-26	-2	-1	-1	-690
1933	-2	-2	-16	-238	-106	-153	-104	-70	-14	-1	-1	-1	-708
1934	-1	-1	-54	-209	-294	-160	-48	-23	-18	-1	-1	-1	-811
1935	-1	-5	-41	-92	-109	-272	0	-102	-34	-3	-2	-1	-662
1936	-2	-2	-42	-240	732	-289	-82	-117	-34	-3	-2	-1	-83
1937	-2	-2	-30	-131	1,169	0	-37	-108	-41	-4	-2	-1	810
1938	-2	-3	-4	-170	0	0	51	-101	-58	-6	-3	-2	-298
1939	-6	-11	-78	-138	-298	-259	-83	-35	-21	-2	-1	-1	-933
1940	-1	-1	-11	-91	0	0	51	-108	-48	-5	-2	-2	-218
1941	-2	-4	-11	326	0	0	0	-52	-67	-7	-4	-2	177
1942	-4	-8	0	0	0	-215	0	-66	-52	-5	-3	-2	-355
1943	-3	-31	-85	0	316	0	-79	-110	-45	-4	-2	-2	-46
1944	-3	-6	-53	-100	-246	-240	-111	-100	-27	-2	-1	-1	-890
1945	-1	-9	-86	-210	1,366	-255	-101	-108	-35	-3	-2	-1	554
1946	-2	-11	1,515	346	-309	-243	-105	-116	-34	-3	-2	-1	1,035
1947	-3	-21	-86	-130	-230	-293	-105	-83	-27	-2	-2	-1	-984
1948	-2	-3	-45	-43	-60	-218	-78	-109	-20	-2	-1	-1	-583
1949	-1	-2	-58	-63	-163	1,745	-104	-113	-33	-3	-2	-1	1,201
1950	-1	-1	-34	-183	-259	-167	-117	-67	-20	-2	-1	-1	-853
1951	-1	0	0	775	279	-98	-107	-110	-52	-5	-3	-2	675
1952	-2	-5	0	0	0	-47	-106	-59	-6	-3	-2	-2	-231
1953	-4	-5	0	1,268	-318	-270	-110	-107	-36	-3	-2	-1	411
1954	-2	-14	-35	-226	-264	-251	-98	-100	-30	-2	-1	-1	-1,024
1955	-1	-5	-48	-187	-186	-199	-116	-99	-23	-2	-1	-1	-868
1956	-1	-2	0	0	0	-233	-96	-115	-57	-6	-3	-2	-516
1957	-5	-5	-34	-108	-238	-224	-115	-101	-25	-2	-1	-1	-860
1958	-1	-4	-86	-185	0	0	0	-66	-68	-7	-4	-2	-423
1959	-4	-4	-39	-223	-186	-173	-93	-55	-22	-2	-1	-1	-803
1960	-1	-1	-15	-113	-274	-72	-56	-44	-13	-1	-1	-1	-592
1961	-1	-9	-35	-82	-63	-191	-43	-32	-13	-1	-1	-1	-472
1962	-1	-1	-29	-35	955	-237	-117	-103	-28	-2	-1	-1	400
1963	-9	-3	-88	709	0	-231	0	-29	-56	-5	-3	-2	283
1964	-4	-43	-91	-190	-114	-129	-100	-66	-21	-2	-1	-1	-762
1965	-1	-10	379	0	-289	-182	-1,059	-106	-49	-5	-2	-2	-1,326
1966	-3	-43	-43	-229	-295	-193	-37	-42	-23	-2	-1	-1	-912
1967	-1	-9	-23	546	367	0	0	-24	-53	-3	-2	-2	793
1968	-3	-5	-84	-152	-302	-285	-110	-98	-26	-2	-1	-1	-1,069
1969	-1	-6	-69	0	0	0	-73	-115	-60	-5	-2	-2	-334
1970	-4	-5	-88	1,384	-305	368	-116	-72	-30	-3	-2	-1	1,125
1971	-2	-42	410	-175	-127	-286	-106	-92	-38	-3	-1	-1	-463
1972	-2	-3	-54	-127	-236	-52	-37	-17	-11	-1	0	0	-540
1973	-1	-13	-69	1,514	0	0	-85	-118	-49	-5	-3	-2	1,168
1974	-7	-46	258	0	-229	-471	0	-103	-76	-9	-3	-1	-687
1975	-4	-7	-89	-201	1,684	0	51	-104	-66	-8	-5	-4	1,246
1976	-6	-7	-35	-32	-36	-88	-36	-16	-7	-1	-1	-1	-266
1977	-2	-3	-12	-55	-23	-49	-25	-18	-7	-1	0	0	-195
1978	0	-1	-85	1,353	956	0	-28	-109	-61	-5	-2	-2	2,015
1979	-2	-4	-26	-212	-172	-236	-102	-76	-23	-2	-1	-1	-857
1980	-3	-8	-62	1,095	0	33	-84	-116	-51	-6	-3	-2	792
1981	-2	-3	-36	-119	-199	-196	-110	-63	-22	-1	-1	-1	-753
1982	-1	-55	-31	0	0	0	0	-57	-65	-6	-3	-2	-220
1983	-3	-32	0	0	0	0	0	-224	-96	-10	-5	-3	-373
1984	-8	-24	0	-235	-199	-221	-110	-111	-42	-3	-2	-1	-956
1985	-3	-49	-82	-93	-167	-279	-68	-70	-30	-2	-2	-1	-846
1986	-1	-4	-50	-48	0	0	-65	-112	-53	-5	-3	-1	-343
1987	-2	-2	-28	-48	-82	-133	-45	-15	-10	-1	-1	-1	-368
1988	-1	-2	-89	-190	-43	-31	-39	-18	-9	-1	-1	-1	-425
1989	-1	-1	-43	-47	-42	-158	-42	-12	-9	-1	-1	-1	-358
1990	-1	-10	-35	-113	-133	-76	-38	-28	-11	-1	-1	-1	-448
1991	-1	-2	-23	-21	-20	-189	-118	-44	-19	-2	-1	-1	-441
1992	-1	-1	-52	-76	988	-274	-112	-56	-28	-2	-1	-1	384
1993	-1	-1	-79	1,629	0	33	-94	-108	-44	-4	-2	-2	1,326
1994	-3	-4	-89	-69	-267	-120	-87	-77	-16	-1	-1	-1	-735
1995	0	-17	-94	0	-297	0	-47	-91	-118	-55	-11	-7	-738
1996	-2	-3	-75	1,684	0	0	-96	-107	-53	-24	-10	-4	1,310
1997	-9	-13	0	0	-296	-215	-108	-55	-25	-11	-6	-3	-741
1998	-4	-74	-66	0	0	0	0	-62	-104	-75	-36	-24	-445
1999	-17	-29	-86	-191	919	-255	-454	-100	-77	-25	-13	-9	-337
2000	-6	-12	-15	-217	1,437	0	-109	-89	-35	-12	-4	-2	936
2001	-3	-5	-12	-127	-218	-216	-107	-54	-12	-3	-2	-1	-760
2002	-1	-10	-15	-226	-227	-265	-115	-60	-25	-5	-2	0	-951
Avg (21-02)	-3	-12	2	72	42	-109	-83	-77	-34	-5	-3	-2	-212
Max (21-02)	0	0	1,515	1,684	1,684	1,745	51	0	0	0	0	0	2,015
Min (21-02)	-17	-74	-94	-240	-318	-471	-1,059	-224	-118	-75	-36	-24	-1,326

Figure 2-2
Alameda Creek Release from ACDD (MG) by Water Year Type



**Table 2-5
Alameda Creek Release from ACDD (MG) by Water Year Type**

Flow past ACDD (MG)

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)								WSIP2018_CSRE_ACDD_RH_DT2300					
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	2	25	485	2,078	2,653	1,915	1,003	135	65	14	6	4	8,385
Above Normal	5	28	317	834	1,328	1,117	364	96	45	8	4	2	4,149
Normal	2	9	224	218	444	356	127	88	28	3	2	1	1,502
Below Normal	2	12	55	183	253	281	100	71	21	2	1	1	982
Dry	2	5	43	98	141	123	53	37	12	1	1	1	516
All Years	3	16	224	678	960	757	327	85	34	5	3	2	3,094

Flow past ACDD (MG)

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)											VBA_BASERH		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	9	449	2,270	2,639	1,876	968	43	0	0	0	0	8,254
Above Normal	2	8	367	1,197	1,725	1,009	226	0	0	0	0	0	4,533
Normal	0	2	311	283	609	295	41	0	0	0	0	0	1,541
Below Normal	0	0	6	15	33	75	0	0	0	0	0	0	128
Dry	0	0	0	0	19	0	0	0	0	0	0	0	19
All Years	0	4	226	749	1,002	648	244	8	0	0	0	0	2,881

Difference in Flow past ACDD (MG)

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)						WSIP2018_CSRE_ACDD_RH_DT2300 minus VBA_BASERH							
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	2	16	35	-192	14	39	35	93	65	14	6	4	130
Above Normal	4	21	-50	-363	-397	108	138	96	45	8	4	2	-383
Normal	2	7	-87	-65	-165	61	86	88	28	3	2	1	-39
Below Normal	2	12	49	168	220	206	100	71	21	2	1	1	853
Dry	2	5	43	98	122	123	53	37	12	1	1	1	498
All Years	2	12	-2	-72	-42	109	83	77	34	5	3	2	212

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

Table 2-6 –Alameda Creek Release from ACDD (MG) (Base Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	140	1,555	762	0	0	0	0	0	0	0	2,457
1922	0	0	153	0	3,212	1,496	0	0	0	0	0	0	4,861
1923	0	0	1,571	624	363	0	0	0	0	0	0	0	2,559
1924	-2	0	0	0	0	0	0	0	0	0	0	0	-2
1925	0	0	0	0	183	0	0	0	0	0	0	0	183
1926	0	0	0	0	2,387	0	160	0	0	0	0	0	2,547
1927	0	129	0	0	2,015	0	17	0	0	0	0	0	2,161
1928	0	0	155	0	62	2,118	457	0	0	0	0	0	2,792
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	955	0	0	0	0	0	0	955
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	382	0	13	0	0	0	0	0	0	0	395
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	86	0	0	0	0	0	0	0	0	86
1935	0	0	0	0	0	0	41	0	0	0	0	0	41
1936	0	0	0	0	1,972	0	0	0	0	0	0	0	1,972
1937	0	0	0	0	1,441	2,050	0	0	0	0	0	0	3,491
1938	0	0	84	0	4,028	2,701	165	0	0	0	0	0	6,978
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	16	2,874	1,764	650	0	0	0	0	0	5,304
1941	0	0	0	448	2,994	2,221	2,778	0	0	0	0	0	8,441
1942	0	0	70	2,209	1,989	412	1,188	0	0	0	0	0	5,868
1943	0	0	0	2,450	910	1,043	0	0	0	0	0	0	4,403
1944	0	0	0	0	0	25	0	0	0	0	0	0	25
1945	0	0	0	0	1,798	0	0	0	0	0	0	0	1,798
1946	0	0	1,515	496	0	0	0	0	0	0	0	0	2,012
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	1,808	0	0	0	0	0	0	1,808
1950	0	0	0	0	75	0	0	0	0	0	0	0	75
1951	0	0	2,222	960	594	928	0	0	0	0	0	0	4,704
1952	0	0	62	3,756	1,480	2,250	0	0	0	0	0	0	7,548
1953	0	0	70	1,577	0	0	0	0	0	0	0	0	1,647
1954	0	0	0	0	67	0	0	0	0	0	0	0	67
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	3,870	2,479	1,787	0	0	0	0	0	0	0	8,136
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	97	2,948	2,600	3,837	0	0	0	0	0	9,482
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	183	0	0	0	0	0	0	0	183
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	1,541	0	0	0	0	0	0	0	1,541
1963	40	0	0	1,689	2,425	0	1,368	0	0	0	0	0	5,522
1964	0	0	0	95	0	0	0	0	0	0	0	0	95
1965	0	0	1,379	3,152	0	0	0	0	0	0	0	0	4,531
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	1,996	610	1,616	1,602	0	0	0	0	0	5,824
1968	0	0	0	69	0	0	0	0	0	0	0	0	69
1969	0	0	0	3,041	3,438	1,204	0	0	0	0	0	0	7,683
1970	0	0	0	1,900	0	796	0	0	0	0	0	0	2,696
1971	0	0	592	0	0	0	0	0	0	0	0	0	592
1972	0	0	1	0	2	0	0	0	0	0	0	0	3
1973	0	14	0	2,074	3,620	1,719	0	0	0	0	0	0	7,427
1974	0	0	770	1,458	0	938	1,425	0	0	0	0	0	4,591
1975	0	0	0	0	2,441	2,700	217	0	0	0	0	0	5,358
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	2,319	1,330	1,656	0	0	0	0	0	0	5,305
1979	0	0	0	41	299	0	0	0	0	0	0	0	340
1980	0	0	0	2,057	3,951	506	0	0	0	0	0	0	6,514
1981	0	0	0	512	0	0	0	0	0	0	0	0	512
1982	0	0	94	2,496	1,508	1,114	3,493	0	0	0	0	0	8,705
1983	0	17	507	3,197	3,829	5,884	1,358	680	0	0	0	0	15,472
1984	0	33	2,261	0	0	0	0	0	0	0	0	0	2,294
1985	0	0	0	0	224	0	0	0	0	0	0	0	224
1986	0	0	0	0	4,512	2,548	0	0	0	0	0	0	7,060
1987	0	0	0	0	69	0	0	0	0	0	0	0	69
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	213	0	0	0	0	0	0	213
1992	0	0	0	0	1,676	0	0	0	0	0	0	0	1,676
1993	0	0	0	2,348	2,037	666	0	0	0	0	0	0	5,051
1994	0	0	0	0	45	0	0	0	0	0	0	0	45
1995	0	0	0	4,734	0	4,221	1	0	0	-1	0	0	8,955
1996	0	0	0	3,118	4,683	2,544	0	0	0	0	0	0	10,345
1997	0	115	2,503	4,755	-1	0	0	0	0	0	0	0	7,372
1998	0	0	0	2,982	5,529	1,019	1,070	0	0	0	0	0	10,600
1999	0	0	0	268	1,789	0	158	0	0	0	0	0	2,215
2000	0	0	0	384	2,448	1,366	0	2	0	0	0	0	4,200
2001	0	0	0	0	18	77	0	0	0	0	0	0	95
2002	0	0	97	0	-1	0	0	0	0	0	0	0	96
Avg (21-02)	0	4	226	749	1,002	648	244	8	0	0	0	0	2,881
Max (21-02)	40	129	3,870	4,755	5,529	5,884	3,837	680	0	0	0	0	15,472
Min (21-02)	-2	0	0	0	-1	0	0	0	0	-1	0	0	-2

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

Table 2-7 – Alameda Creek Release from ACDD (MG) (Revised WSIP 2018 Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	1	65	140	721	321	228	98	63	19	3	2	1	1,662
1922	2	2	156	195	3,212	1,496	71	125	34	4	2	1	5,301
1923	2	69	641	208	304	152	107	68	7	3	2	1	1,564
1924	0	0	0	0	0	1	3	0	0	0	0	0	4
1925	0	1	88	129	355	83	105	129	5	2	1	1	900
1926	1	1	3	134	1,418	180	218	47	7	2	1	1	2,013
1927	1	201	73	210	2,015	260	122	84	8	3	2	1	2,980
1928	2	2	224	176	331	2,118	407	81	3	3	2	1	3,350
1929	2	2	87	239	242	311	138	41	19	1	1	1	1,085
1930	1	1	11	219	314	1,095	106	49	11	2	1	1	1,811
1931	2	2	20	140	60	72	24	18	10	1	1	1	351
1932	1	1	382	193	217	127	90	44	26	2	1	1	1,085
1933	2	2	16	238	106	153	104	70	14	1	1	1	708
1934	1	1	54	295	294	160	48	23	18	1	1	1	897
1935	1	5	41	92	109	272	41	102	34	3	2	1	703
1936	2	2	42	240	1,240	289	82	117	34	3	2	1	2,055
1937	2	2	30	131	272	2,050	37	108	41	4	2	1	2,681
1938	2	3	88	170	4,028	2,701	115	101	58	6	3	2	7,277
1939	6	11	78	138	298	259	83	35	21	2	1	1	933
1940	1	1	11	107	2,874	1,764	600	108	48	5	2	2	5,522
1941	2	4	11	122	2,994	2,221	2,778	52	67	7	4	2	8,264
1942	4	8	70	2,209	1,989	627	1,188	66	52	5	3	2	6,223
1943	3	31	85	2,450	594	1,043	79	110	45	4	2	2	4,449
1944	3	6	53	100	246	265	111	100	27	2	1	1	915
1945	1	9	86	210	432	255	101	108	35	3	2	1	1,244
1946	2	11	0	150	309	243	105	116	34	3	2	1	976
1947	3	21	86	130	230	293	105	83	27	2	2	1	984
1948	2	3	45	43	60	218	78	109	20	2	1	1	583
1949	1	2	58	63	163	63	104	113	33	3	2	1	607
1950	1	1	34	183	334	167	117	67	20	2	1	1	928
1951	1	0	2,222	185	315	1,026	107	110	52	5	3	2	4,029
1952	2	5	62	3,756	1,480	2,250	47	106	59	6	3	2	7,779
1953	4	5	70	309	318	270	110	107	36	3	2	1	1,236
1954	2	14	35	226	331	251	98	100	30	2	1	1	1,091
1955	1	5	48	187	186	199	116	99	23	2	1	1	868
1956	1	2	3,870	2,479	1,787	233	96	115	57	6	3	2	8,652
1957	5	5	34	108	238	224	115	101	25	2	1	1	860
1958	1	4	86	282	2,948	2,600	3,837	66	68	7	4	2	9,905
1959	4	4	39	223	186	173	93	55	22	2	1	1	803
1960	1	1	15	113	457	72	56	44	13	1	1	1	775
1961	1	9	35	82	63	191	43	32	13	1	1	1	472
1962	1	1	29	35	586	237	117	103	28	2	1	1	1,141
1963	49	3	88	980	2,425	231	1,368	29	56	5	3	2	5,239
1964	4	43	91	285	114	129	100	66	21	2	1	1	857
1965	1	10	1,000	3,152	289	182	1,059	106	49	5	2	2	5,857
1966	3	43	43	229	295	193	37	42	23	2	1	1	912
1967	1	9	23	1,450	243	1,616	1,602	24	53	5	3	2	5,031
1968	3	5	84	221	302	285	110	98	26	2	1	1	1,138
1969	1	6	69	3,041	3,438	1,204	73	115	60	5	2	2	8,017
1970	4	5	88	516	305	428	116	72	30	3	2	1	1,571
1971	2	42	182	175	127	286	106	92	38	3	1	1	1,055
1972	2	3	55	127	238	52	37	17	11	1	0	0	543
1973	1	27	69	560	3,620	1,719	85	118	49	5	3	2	6,259
1974	7	46	512	1,458	229	1,409	1,425	103	76	9	3	1	5,278
1975	4	7	89	201	757	2,700	167	104	66	8	5	4	4,112
1976	6	7	35	32	36	88	36	16	7	1	1	1	266
1977	2	3	12	55	23	49	25	18	7	1	0	0	195
1978	0	1	85	966	374	1,656	28	109	61	5	2	2	3,290
1979	2	4	26	253	471	236	102	76	23	2	1	1	1,197
1980	3	8	62	962	3,951	473	84	116	51	6	3	2	5,722
1981	2	3	36	631	199	196	110	63	22	1	1	1	1,265
1982	1	55	125	2,496	1,508	1,114	3,493	57	65	6	3	2	8,925
1983	3	49	507	3,197	3,829	5,884	1,358	904	96	10	5	3	15,845
1984	8	57	2,261	235	199	221	110	111	42	3	2	1	3,250
1985	3	49	82	93	391	279	68	70	30	2	2	1	1,070
1986	1	4	50	48	4,512	2,548	65	112	53	5	3	1	7,403
1987	2	2	28	48	151	133	45	15	10	1	1	1	437
1988	1	2	89	190	43	31	39	18	9	1	1	1	425
1989	1	1	43	47	42	158	42	12	9	1	1	1	358
1990	1	10	35	113	133	76	38	28	11	1	1	1	448
1991	1	2	23	21	20	402	118	44	19	2	1	1	654
1992	1	1	52	76	688	274	112	56	28	2	1	1	1,292
1993	1	1	79	719	2,037	633	94	108	44	4	2	2	3,725
1994	3	4	89	69	312	120	87	77	16	1	1	1	780
1995	0	17	94	4,734	297	4,221	48	91	118	54	11	7	9,693
1996	2	3	75	1,434	4,683	2,544	96	107	53	24	10	4	9,036
1997	9	128	2,503	4,755	295	215	108	55	25	11	6	3	8,113
1998	4	74	66	2,982	5,529	1,019	1,070	62	104	75	36	24	11,045
1999	17	29	86	459	869	255	612	100	77	25	13	9	2,551
2000	6	12	15	601	1,011	1,366	109	91	35	12	4	2	3,264
2001	3	5	12	127	236	293	107	54	12	3	2	1	855
2002	1	10	112	226	226	265	115	60	25	5	2	0	1,047
Avg (21-02)	3	16	224	678	960	757	327	85	34	5	3	2	3,094
Max (21-02)	49	201	3,870	4,755	5,529	5,884	3,837	904	118	75	36	24	15,845
Min (21-02)	0	0	0	0	0	1	3	0	0	0	0	0	4

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

Table 2-8 – Difference in Alameda Creek Release from ACDD (MG) (Revised WSIP 2018 minus Base Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	1	65	0	-834	-441	228	98	63	19	3	2	1	-795
1922	2	2	3	195	0	0	71	125	34	4	2	1	440
1923	2	69	-930	-416	-59	152	107	68	7	3	2	1	-994
1924	2	0	0	0	0	1	3	0	0	0	0	0	6
1925	0	1	88	129	172	83	105	129	5	2	1	1	717
1926	1	1	3	134	-969	180	58	47	7	2	1	1	-534
1927	1	72	73	210	0	260	105	84	8	3	2	1	819
1928	2	2	69	176	269	0	-51	81	3	3	2	1	557
1929	2	2	87	239	242	311	138	41	19	1	1	1	1,085
1930	1	1	11	219	314	140	106	49	11	2	1	1	856
1931	2	2	20	140	60	72	24	18	10	1	1	1	351
1932	1	1	0	193	204	127	90	44	26	2	1	1	690
1933	2	2	16	238	106	153	104	70	14	1	1	1	708
1934	1	1	54	209	294	160	48	23	18	1	1	1	811
1935	1	5	41	92	109	272	0	102	34	3	2	1	662
1936	2	2	42	240	-732	289	82	117	34	3	2	1	83
1937	2	2	30	131	-1,169	0	37	108	41	4	2	1	-810
1938	2	3	4	170	0	0	-51	101	58	6	3	2	298
1939	6	11	78	138	298	259	83	35	21	2	1	1	933
1940	1	1	11	91	0	0	-51	108	48	5	2	2	218
1941	2	4	11	-326	0	0	0	52	67	7	4	2	-177
1942	4	8	0	0	0	215	0	66	52	5	3	2	355
1943	3	31	85	0	-316	0	79	110	45	4	2	2	46
1944	3	6	53	100	246	240	111	100	27	2	1	1	890
1945	1	9	86	210	-1,366	255	101	108	35	3	2	1	-554
1946	2	11	-1,515	-346	309	243	105	116	34	3	2	1	-1,035
1947	3	21	86	130	230	293	105	83	27	2	2	1	984
1948	2	3	45	43	60	218	78	109	20	2	1	1	583
1949	1	2	58	63	163	-1,745	104	113	33	3	2	1	-1,201
1950	1	1	34	183	259	167	117	67	20	2	1	1	853
1951	1	0	0	-775	-279	98	107	110	52	5	3	2	-675
1952	2	5	0	0	0	0	47	106	59	6	3	2	231
1953	4	5	0	-1,268	318	270	110	107	36	3	2	1	-411
1954	2	14	35	226	264	251	98	100	30	2	1	1	1,024
1955	1	5	48	187	186	199	116	99	23	2	1	1	868
1956	1	2	0	0	0	233	96	115	57	6	3	2	516
1957	5	5	34	108	238	224	115	101	25	2	1	1	860
1958	1	4	86	185	0	0	0	66	68	7	4	2	423
1959	4	4	39	223	186	173	93	55	22	2	1	1	803
1960	1	1	15	113	274	72	56	44	13	1	1	1	592
1961	1	9	35	82	63	191	43	32	13	1	1	1	472
1962	1	1	29	35	-955	237	117	103	28	2	1	1	-400
1963	9	3	88	-709	0	231	0	29	56	5	3	2	-283
1964	4	43	91	190	114	129	100	66	21	2	1	1	762
1965	1	10	-379	0	289	182	1,059	106	49	5	2	2	1,326
1966	3	43	43	229	295	193	37	42	23	2	1	1	912
1967	1	9	23	-546	-367	0	0	24	53	5	3	2	-793
1968	3	5	84	152	302	285	110	98	26	2	1	1	1,069
1969	1	6	69	0	0	0	73	115	60	5	2	2	334
1970	4	5	88	-1,384	305	-368	116	72	30	3	2	1	-1,125
1971	2	42	-410	175	127	286	106	92	38	3	1	1	463
1972	2	3	54	127	236	52	37	17	11	1	0	0	540
1973	1	13	69	-1,514	0	0	85	118	49	5	3	2	-1,168
1974	7	46	-258	0	229	471	0	103	76	9	3	1	687
1975	4	7	89	201	-1,684	0	-51	104	66	8	5	4	-1,246
1976	6	7	35	32	36	88	36	16	7	1	1	1	266
1977	2	3	12	55	23	49	25	18	7	1	0	0	195
1978	0	1	85	-1,353	-956	0	28	109	61	5	2	2	-2,015
1979	2	4	26	212	172	236	102	76	23	2	1	1	857
1980	3	8	62	-1,095	0	-33	84	116	51	6	3	2	-792
1981	2	3	36	119	199	196	110	63	22	1	1	1	753
1982	1	55	31	0	0	0	0	57	65	6	3	2	220
1983	3	32	0	0	0	0	0	224	96	10	5	3	373
1984	8	24	0	235	199	221	110	111	42	3	2	1	956
1985	3	49	82	93	167	279	68	70	30	2	2	1	846
1986	1	4	50	48	0	0	65	112	53	5	3	1	343
1987	2	2	28	48	82	133	45	15	10	1	1	1	368
1988	1	2	89	190	43	31	39	18	9	1	1	1	425
1989	1	1	43	47	42	158	42	12	9	1	1	1	358
1990	1	10	35	113	133	76	38	28	11	1	1	1	448
1991	1	2	23	21	20	189	118	44	19	2	1	1	441
1992	1	1	52	76	-988	274	112	56	28	2	1	1	-384
1993	1	1	79	-1,629	0	-33	94	108	44	4	2	2	-1,326
1994	3	4	89	69	267	120	87	77	16	1	1	1	735
1995	0	17	94	0	297	0	47	91	118	55	11	7	738
1996	2	3	75	-1,684	0	0	96	107	53	24	10	4	-1,310
1997	9	13	0	0	296	215	108	55	25	11	6	3	741
1998	4	74	66	0	0	0	0	62	104	75	36	24	445
1999	17	29	86	191	-919	255	454	100	77	25	13	9	337
2000	6	12	15	217	-1,437	0	109	89	35	12	4	2	-936
2001	3	5	12	127	218	216	107	54	12	3	2	1	760
2002	1	10	15	226	227	265	115	60	25	5	2	0	951
Avg (21-02)	3	12	-2	-72	-42	109	83	77	34	5	3	2	212
Max (21-02)	17	74	94	240	318	471	1,059	224	118	75	36	24	1,326
Min (21-02)	0	0	-1,515	-1,684	-1,684	-1,745	-51	0	0	0	0	0	-2,015

Figure 2-3
Calaveras Creek Release from Calaveras Dam (MG) by Water Year Type

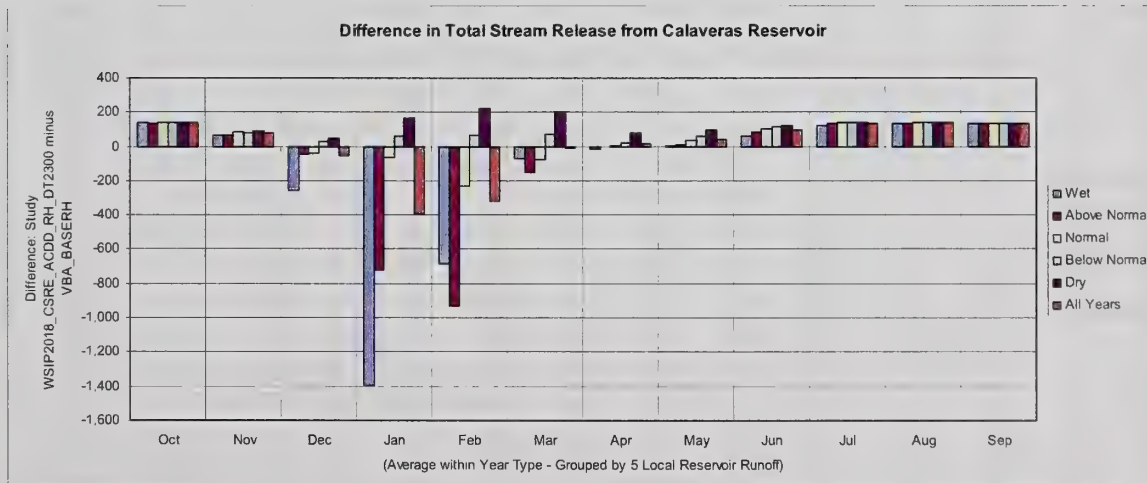
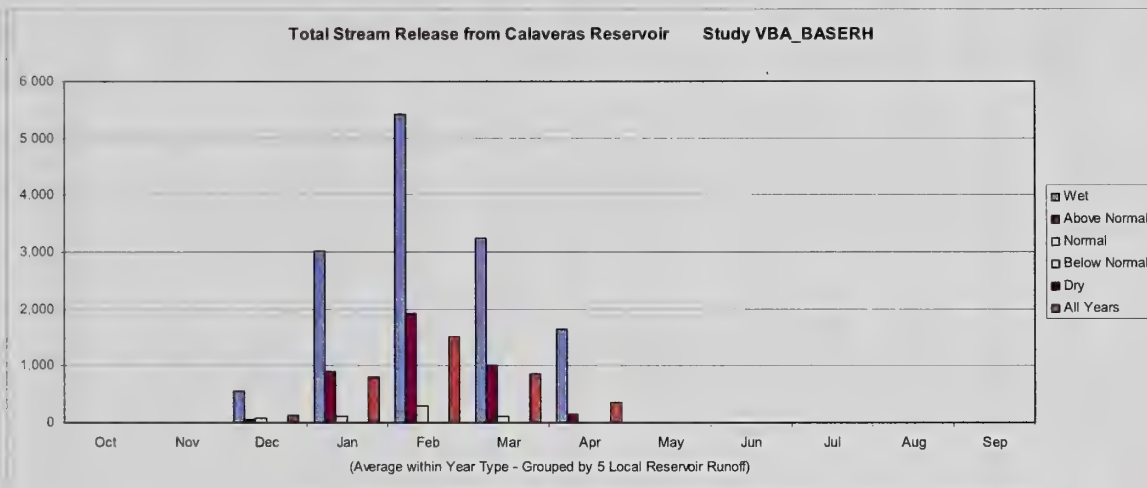
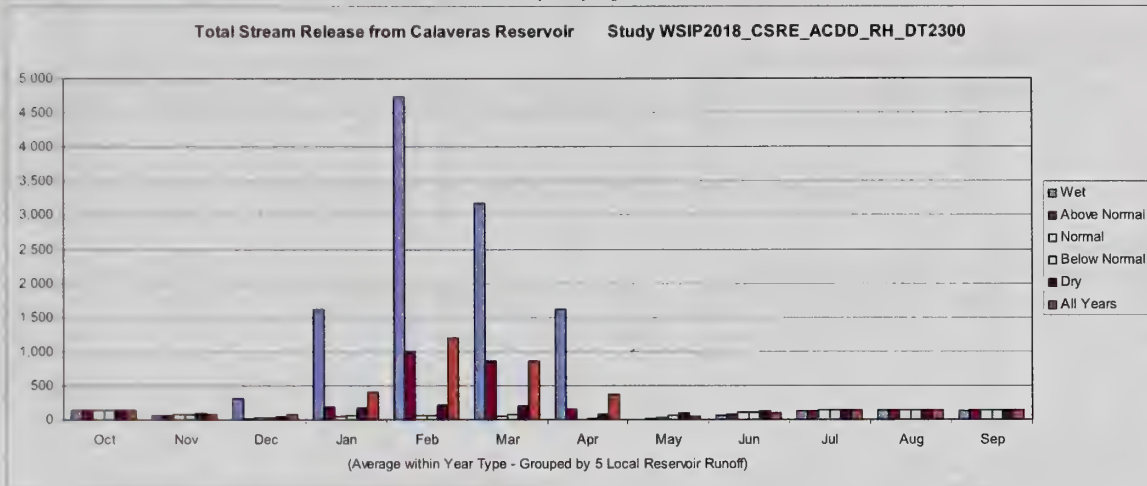


Table 2-9
Calaveras Creek Release from Calaveras Reservoir (MG) by Water Year Type

Total Stream Release from Calaveras Reservoir

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

WSIP2018_CSRE_ACDD_RH_DT2300

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	138	64	310	1,623	4,730	3,180	1,622	5	61	122	133	131	12,119
Above Normal	135	63	14	179	994	855	149	11	83	131	136	133	2,884
Normal	138	82	30	54	60	39	2	33	104	137	139	135	953
Below Normal	138	78	31	61	65	71	20	56	113	138	139	135	1,044
Dry	138	90	49	166	218	203	77	96	123	139	139	135	1,572
All Years	137	75	85	409	1,197	860	367	40	97	134	137	134	3,672

Total Stream Release from Calaveras Reservoir

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

VBA_BASERH

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	567	3,020	5,416	3,248	1,637	0	0	0	0	0	13,889
Above Normal	0	0	60	901	1,928	1,009	150	0	0	0	0	0	4,048
Normal	0	0	70	119	293	115	0	0	0	0	0	0	597
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	137	799	1,514	865	350	0	0	0	0	0	3,666

Difference in Total Stream Release from Calaveras Reservoir

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

WSIP2018_CSRE_ACDD_RH_DT2300 minus VBA_BASERH

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	138	64	-257	-1,397	-686	-68	-15	5	61	122	133	131	-1,770
Above Normal	135	63	-46	-722	-934	-154	0	11	83	131	136	133	-1,164
Normal	138	82	-40	-65	-233	-76	2	33	104	137	139	135	356
Below Normal	138	78	31	61	65	71	20	56	113	138	139	135	1,044
Dry	138	90	49	166	218	203	77	96	123	139	139	135	1,572
All Years	137	75	-52	-390	-317	-6	16	40	97	134	137	134	6

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

Table 2-10 – Calaveras Creek Release from Calaveras Reservoir (MG) (Base Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	1,174	0	0	0	0	0	0	0	0	1,174
1922	0	0	0	0	4,965	1,638	0	0	0	0	0	0	6,603
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	2,424	0	0	0	0	0	0	0	2,424
1927	0	0	0	0	1,947	0	0	0	0	0	0	0	1,947
1928	0	0	0	0	0	1,391	0	0	0	0	0	0	1,391
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	1,230	0	0	0	0	0	0	0	1,230
1937	0	0	0	0	0	3,283	0	0	0	0	0	0	3,283
1938	0	0	0	0	7,414	5,244	0	0	0	0	0	0	12,658
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	5,333	2,442	0	0	0	0	0	0	7,775
1941	0	0	0	0	6,409	3,805	5,534	0	0	0	0	0	15,748
1942	0	0	0	1,804	3,379	0	667	0	0	0	0	0	5,850
1943	0	0	0	2,265	115	213	0	0	0	0	0	0	2,593
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	676	0	0	0	0	0	0	0	676
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	449	0	0	0	0	0	0	449
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	1,021	0	0	0	0	0	0	0	0	0	1,021
1952	0	0	0	7,120	1,875	3,887	0	0	0	0	0	0	12,882
1953	0	0	0	1,162	0	0	0	0	0	0	0	0	1,162
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	6,613	4,612	2,802	0	0	0	0	0	0	0	14,028
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	4,176	4,942	8,707	0	0	0	0	0	17,825
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	171	4,747	0	1,245	0	0	0	0	0	6,163
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	6,583	0	0	0	0	0	0	0	0	6,583
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	1,044	0	1,980	2,000	0	0	0	0	0	5,024
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	4,186	7,735	762	0	0	0	0	0	0	12,683
1970	0	0	0	736	0	0	0	0	0	0	0	0	736
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	1,000	7,770	2,059	0	0	0	0	0	0	10,829
1974	0	0	0	1,357	0	0	1,299	0	0	0	0	0	2,656
1975	0	0	0	0	2,594	5,169	0	0	0	0	0	0	7,763
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	1,655	1,431	2,114	0	0	0	0	0	0	5,200
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	1,223	9,235	0	0	0	0	0	0	0	10,458
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	2,429	1,885	437	7,496	0	0	0	0	0	12,247
1983	0	0	0	5,233	8,809	14,616	1,253	0	0	0	0	0	29,911
1984	0	0	1,126	0	0	0	0	0	0	0	0	0	1,126
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	8,755	4,783	0	0	0	0	0	0	13,538
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	354	0	0	0	0	0	0	0	354
1993	0	0	0	2,114	3,548	0	0	0	0	0	0	0	5,662
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	6,068	0	8,698	0	0	0	0	0	0	14,766
1996	0	0	0	0	6,477	1,462	0	0	0	0	0	0	7,939
1997	0	0	2,465	11,251	0	0	0	0	0	0	0	0	13,717
1998	0	0	0	2,344	16,415	756	537	0	0	0	0	0	20,052
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	1,624	829	0	0	0	0	0	0	2,453
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	137	799	1,514	865	350	0	0	0	0	0	3,666
Max (21-02)	0	0	6,613	11,251	16,415	14,616	8,707	0	0	0	0	0	29,911
Min (21-02)	0	0	0	0	0	0	0	0	0	0	0	0	0

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

Table 2-11 – Calaveras Creek Release from Calaveras Reservoir (MG) (Revised WSIP 2018 Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	139	32	0	0	0	62	12	51	110	137	138	135	817
1922	138	95	0	0	3,841	1,605	0	0	99	136	138	135	6,187
1923	138	22	0	0	0	174	0	67	129	137	138	135	940
1924	138	97	100	275	362	348	140	140	136	140	140	136	2,153
1925	140	96	0	136	0	241	0	0	129	138	139	135	1,154
1926	139	96	97	140	0	151	0	91	129	138	139	135	1,255
1927	139	0	0	0	1,027	0	0	27	116	137	138	135	1,720
1928	138	95	0	56	29	128	0	52	131	136	138	135	1,038
1929	138	93	0	24	98	0	0	98	117	139	139	135	981
1930	139	96	83	0	13	0	18	79	117	138	139	135	958
1931	138	95	78	120	295	264	115	119	126	139	139	135	1,764
1932	139	96	0	0	0	197	36	87	107	138	139	135	1,075
1933	138	95	82	0	244	167	20	57	121	139	139	135	1,338
1934	139	96	0	0	0	158	86	112	117	139	139	135	1,122
1935	139	90	54	0	241	0	0	0	98	136	138	135	1,031
1936	138	95	53	0	0	0	0	0	98	136	138	135	793
1937	138	95	66	129	0	2,212	0	0	90	135	138	135	3,138
1938	138	93	0	0	6,472	5,211	0	0	70	131	136	134	12,385
1939	133	80	0	122	30	43	45	99	113	138	139	135	1,078
1940	139	96	88	0	2,160	2,409	0	0	82	133	137	134	5,379
1941	138	92	0	0	4,304	3,772	5,484	0	60	129	135	133	14,247
1942	135	85	0	0	2,734	0	715	0	77	133	136	134	4,149
1943	136	46	0	0	0	180	0	0	86	134	138	134	854
1944	137	88	41	164	0	0	0	21	106	138	139	135	969
1945	139	84	4	41	0	0	0	0	97	136	138	135	774
1946	138	80	0	0	0	60	0	0	98	136	138	135	785
1947	136	64	0	131	107	0	0	42	107	138	138	135	998
1948	138	93	50	227	295	90	0	0	114	138	139	135	1,419
1949	139	95	35	205	180	0	0	0	99	136	138	135	1,162
1950	139	96	62	0	0	150	0	60	114	138	139	135	1,034
1951	139	0	0	0	0	0	0	0	78	133	136	134	620
1952	138	90	0	4,689	1,856	3,854	0	0	69	131	136	134	11,097
1953	135	90	0	0	0	0	0	0	96	136	138	135	730
1954	138	75	61	0	0	0	0	21	103	138	139	135	811
1955	139	90	0	0	155	112	0	22	111	138	139	135	1,041
1956	139	95	4,242	4,597	2,783	0	0	0	71	131	136	134	12,327
1957	134	90	62	155	0	83	0	0	109	138	139	135	1,045
1958	139	91	0	0	3,256	4,909	8,657	0	59	129	135	133	17,508
1959	135	92	56	0	0	143	32	75	112	138	139	135	1,058
1960	139	96	83	149	0	263	76	88	122	139	139	135	1,430
1961	139	84	61	184	292	124	92	102	123	139	139	135	1,615
1962	139	96	68	236	0	0	0	17	105	138	139	135	1,073
1963	115	93	0	0	2,785	0	1,289	0	73	132	136	134	4,757
1964	134	29	0	0	236	198	26	63	114	138	139	135	1,213
1965	139	81	0	2,868	0	132	0	0	81	133	137	134	3,705
1966	136	28	0	0	0	122	99	90	111	138	139	135	999
1967	139	83	0	0	0	1,472	1,950	0	76	133	136	134	4,123
1968	136	90	6	0	0	0	0	23	108	138	139	135	776
1969	139	89	0	1,772	7,716	729	0	0	68	133	137	134	10,917
1970	135	90	0	0	0	0	0	54	103	136	138	135	791
1971	138	28	0	0	221	0	0	31	94	136	139	135	922
1972	138	94	0	134	99	287	99	120	125	139	140	136	1,512
1973	139	0	0	0	7,751	2,026	0	0	81	133	136	134	10,400
1974	130	0	0	0	108	0	1,239	0	50	126	136	135	1,924
1975	135	86	0	51	0	4,878	0	0	61	128	133	130	5,602
1976	132	87	62	240	322	247	101	121	129	139	139	135	1,855
1977	138	94	87	214	336	291	114	119	129	139	140	136	1,938
1978	140	96	0	0	0	1,452	0	0	67	133	137	134	2,160
1979	138	92	71	0	0	0	0	50	111	137	139	135	874
1980	137	85	0	0	7,287	0	0	0	78	131	136	134	7,988
1981	138	94	60	0	140	0	0	65	112	139	139	135	1,023
1982	139	6	0	15	1,866	404	7,446	0	62	131	136	134	10,339
1983	136	33	0	2,802	8,790	14,583	1,203	0	26	124	132	132	27,961
1984	129	0	0	0	142	90	0	0	90	136	138	135	860
1985	137	0	0	173	154	0	64	59	104	138	138	135	1,103
1986	139	92	44	221	4,681	4,750	0	0	76	133	136	135	10,407
1987	138	95	69	222	263	191	90	122	126	139	139	135	1,730
1988	139	95	0	64	314	312	97	119	127	139	139	135	1,681
1989	139	96	52	223	315	161	93	126	127	139	139	135	1,746
1990	139	82	61	150	215	260	98	107	125	139	139	135	1,651
1991	139	95	74	251	340	0	0	88	116	138	139	135	1,515
1992	139	96	42	190	0	0	0	73	105	138	139	135	1,057
1993	139	96	0	0	1,453	0	0	0	87	134	138	134	2,181
1994	137	92	1	198	0	206	40	49	119	139	139	135	1,256
1995	140	79	0	629	0	8,349	0	0	0	76	126	127	9,526
1996	137	93	0	0	5,526	1,429	0	0	73	113	129	131	7,632
1997	130	0	674	11,236	0	97	14	73	107	127	133	132	12,724
1998	135	11	0	0	16,191	723	487	0	0	50	97	108	17,802
1999	119	62	0	0	0	0	0	0	45	111	125	127	589
2000	134	82	81	0	0	0	0	34	96	126	136	133	823
2001	136	90	84	129	0	0	0	75	122	137	138	135	1,046
2002	139	85	0	0	112	0	4	69	109	135	138	136	928
Avg (21-02)	137	75	85	409	1,197	860	367	40	97	134	137	134	3,672
Max (21-02)	140	97	4,242	11,236	16,191	14,583	8,657	140	136	140	140	136	27,961
Min (21-02)	115	0	0	0	0	0	0	0	0	50	97	108	589

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

Table 2-12 – Difference in Calaveras Creek Release (MG) (Revised 2018 WSIP minus Base Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	139	32	0	-1,174	0	62	12	51	110	137	138	135	-357
1922	138	95	0	0	-1,124	-33	0	0	99	136	138	135	-416
1923	138	22	0	0	0	174	0	67	129	137	138	135	940
1924	138	97	100	275	362	348	140	140	136	140	140	136	2,153
1925	140	96	0	136	0	241	0	0	129	138	139	135	1,154
1926	139	96	97	140	-2,424	151	0	91	129	138	139	135	-1,168
1927	139	0	0	0	-919	0	0	27	116	137	138	135	-227
1928	138	95	0	56	29	-1,263	0	52	131	136	138	135	-353
1929	138	93	0	24	98	0	0	98	117	139	139	135	981
1930	139	96	83	0	13	0	18	79	117	138	139	135	958
1931	138	95	78	120	295	264	115	119	126	139	139	135	1,764
1932	139	96	0	0	0	197	36	87	107	138	139	135	1,075
1933	138	95	82	0	244	167	20	57	121	139	139	135	1,338
1934	139	96	0	0	0	158	86	112	117	139	139	135	1,122
1935	139	90	54	0	241	0	0	0	98	136	138	135	1,031
1936	138	95	53	0	-1,230	0	0	0	98	136	138	135	-436
1937	138	95	66	129	0	-1,071	0	0	90	135	138	135	-145
1938	138	93	0	0	-942	-33	0	0	70	131	136	134	-273
1939	133	80	0	122	30	43	45	99	113	138	139	135	1,078
1940	139	96	88	0	-3,173	-33	0	0	82	133	137	134	-2,397
1941	138	92	0	0	-2,105	-33	-51	0	60	129	135	133	-1,502
1942	135	85	0	-1,804	-645	0	48	0	77	133	136	134	-1,701
1943	136	46	0	-2,265	-115	-33	0	0	86	134	138	134	-1,739
1944	137	88	41	164	0	0	0	21	106	138	139	135	969
1945	139	84	4	41	-676	0	0	0	97	136	138	135	98
1946	138	80	0	0	0	60	0	0	98	136	138	135	785
1947	136	64	0	131	107	0	0	42	107	138	138	135	998
1948	138	93	50	227	295	90	0	0	114	138	139	135	1,419
1949	139	95	35	205	180	-449	0	0	99	136	138	135	713
1950	139	96	62	0	0	150	0	60	114	138	139	135	1,034
1951	139	0	-1,021	0	0	0	0	0	78	133	136	134	-401
1952	138	90	0	-2,430	-19	-33	0	0	69	131	136	134	-1,785
1953	135	90	0	-1,162	0	0	0	0	96	136	138	135	-432
1954	138	75	61	0	0	0	0	21	103	138	139	135	811
1955	139	90	0	0	155	112	0	22	111	138	139	135	1,041
1956	139	95	-2,372	-15	-19	0	0	0	71	131	136	134	-1,700
1957	134	90	62	155	0	83	0	0	109	138	139	135	1,045
1958	139	91	0	0	-919	-33	-51	0	59	129	135	133	-317
1959	135	92	56	0	0	143	32	75	112	138	139	135	1,058
1960	139	96	83	149	0	263	76	88	122	139	139	135	1,430
1961	139	84	61	184	292	124	92	102	123	139	139	135	1,615
1962	139	96	68	236	0	0	0	17	105	138	139	135	1,073
1963	115	93	0	-171	-1,962	0	44	0	73	132	136	134	-1,406
1964	134	29	0	0	236	198	26	63	114	138	139	135	1,213
1965	139	81	0	-3,715	0	132	0	0	81	133	137	134	-2,878
1966	136	28	0	0	0	122	99	90	111	138	139	135	999
1967	139	83	0	-1,044	0	-508	-51	0	76	133	136	134	-901
1968	136	90	6	0	0	0	0	23	108	138	139	135	776
1969	139	89	0	-2,414	-19	-33	0	0	68	133	137	134	-1,766
1970	135	90	0	-736	0	0	0	54	103	136	138	135	55
1971	138	28	0	0	221	0	0	31	94	136	139	135	922
1972	138	94	0	134	99	287	99	120	125	139	140	136	1,512
1973	139	0	0	-1,000	-19	-33	0	0	81	133	136	134	-429
1974	130	0	0	-1,357	108	0	-60	0	50	126	136	135	-732
1975	135	86	0	51	-2,594	-291	0	0	61	128	133	130	-2,160
1976	132	87	62	240	322	247	101	121	129	139	139	135	1,855
1977	138	94	87	214	336	291	114	119	129	139	140	136	1,938
1978	140	96	0	-1,655	-1,431	-662	0	0	67	133	137	134	-3,040
1979	138	92	71	0	0	0	0	50	111	137	139	135	874
1980	137	85	0	-1,223	-1,948	0	0	0	78	131	136	134	-2,470
1981	138	94	60	0	140	0	0	65	112	139	139	135	1,023
1982	139	6	0	-2,414	-19	-33	-51	0	62	131	136	134	-1,909
1983	136	33	0	-2,430	-19	-33	-51	0	26	124	132	132	-1,950
1984	129	0	-1,126	0	142	90	0	0	90	136	138	135	-266
1985	137	0	0	173	154	0	64	59	104	138	138	135	1,103
1986	139	92	44	221	-4,074	-33	0	0	76	133	136	135	-3,131
1987	138	95	69	222	263	191	90	122	126	139	139	135	1,730
1988	139	95	0	64	314	312	97	119	127	139	139	135	1,681
1989	139	96	52	223	315	161	93	126	127	139	139	135	1,746
1990	139	82	61	150	215	260	98	107	125	139	139	135	1,651
1991	139	95	74	251	340	0	0	88	116	138	139	135	1,515
1992	139	96	42	190	-354	0	0	73	105	138	139	135	704
1993	139	96	0	-2,114	-2,095	0	0	0	87	134	138	134	-3,481
1994	137	92	1	198	0	206	40	49	119	139	139	135	1,256
1995	140	79	0	-5,439	0	-349	0	0	0	76	126	127	-5,240
1996	137	93	0	0	-951	-33	0	0	73	113	129	131	-307
1997	130	0	-1,792	-15	0	97	14	73	107	127	133	132	-993
1998	135	11	0	-2,344	-224	-33	-51	0	0	50	97	108	-2,251
1999	119	62	0	0	0	0	0	0	45	111	125	127	589
2000	134	82	81	0	-1,624	-829	0	34	96	126	136	133	-1,630
2001	136	90	84	129	0	0	0	75	122	137	138	135	1,046
2002	139	85	0	0	112	0	4	69	109	135	138	136	928
Avg (21-02)	137	75	-52	-390	-317	-6	16	40	97	134	137	134	6
Max (21-02)	140	97	100	275	362	348	140	140	136	140	140	136	2,153
Min (21-02)	115	0	-2,372	-5,439	-4,074	-1,263	-60	0	0	50	97	108	-5,240

Figure 2-4
Flow at Alameda/Calaveras Creek Confluence

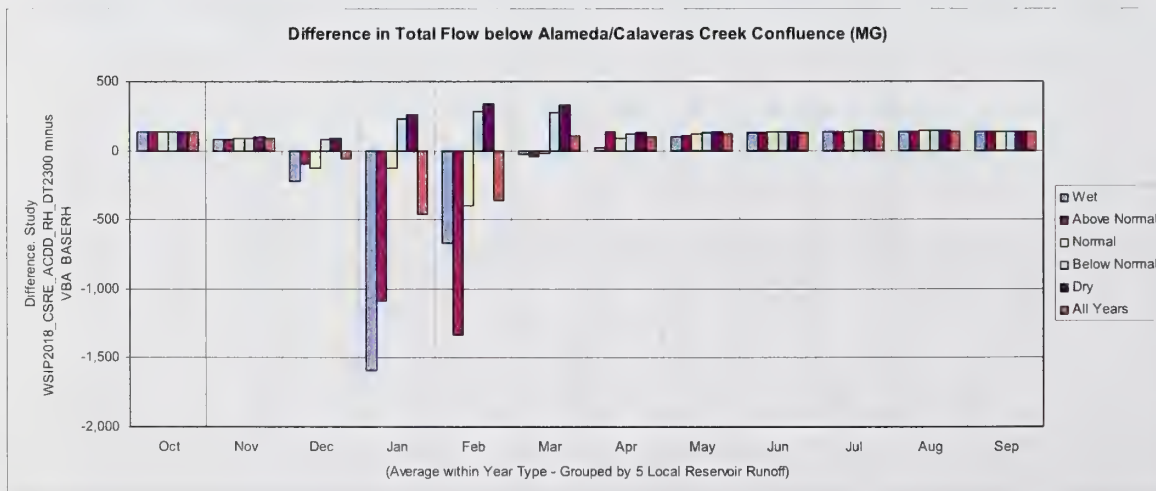
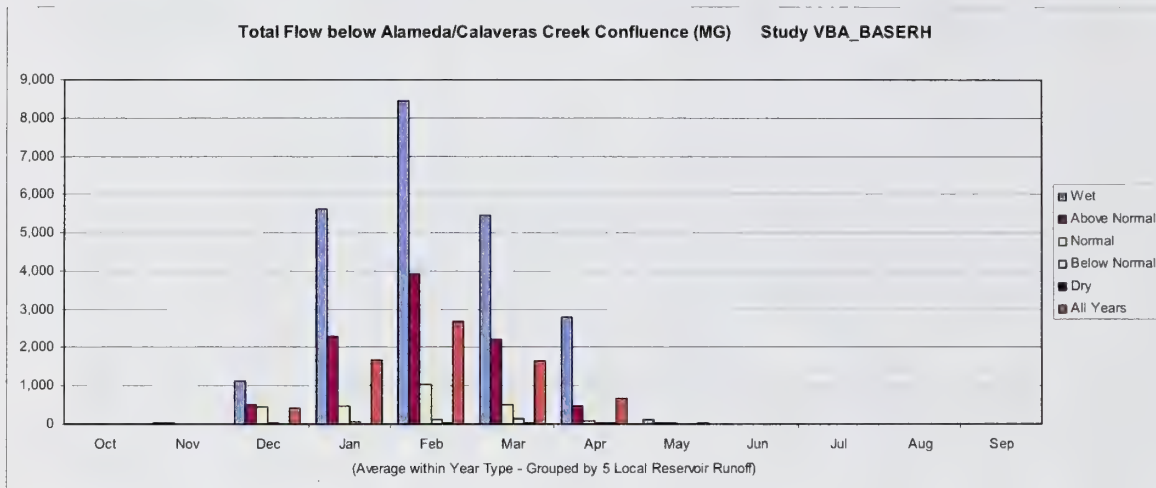
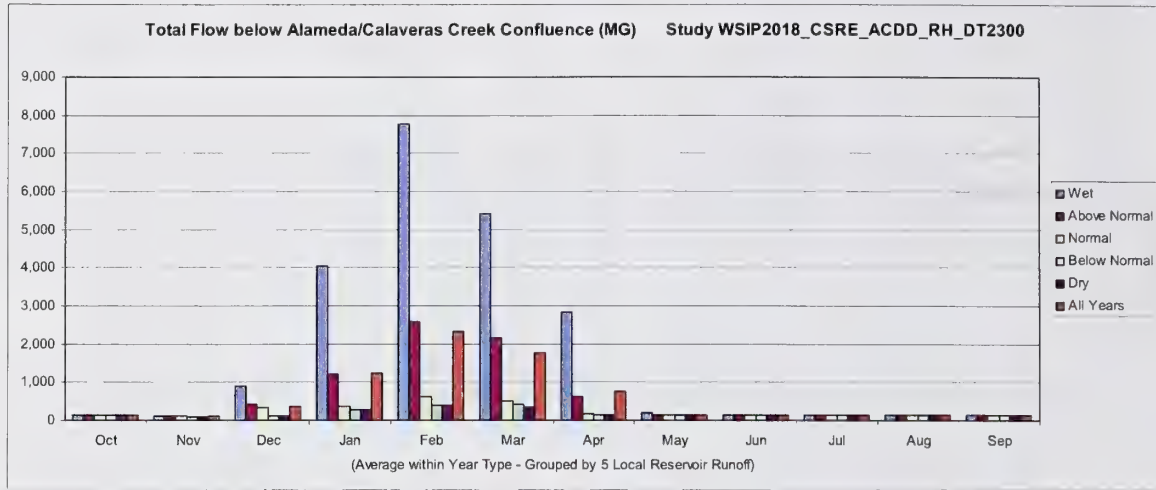


Table 2-13
Flow at Alameda/Calaveras Creek Confluence

Total Flow below Alameda/Calaveras Creek Confluence (MG)

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

	WSIP2018_CSRE_ACDD_RH_DT2300												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	140	106	907	4,029	7,771	5,416	2,821	197	136	140	140	136	21,939
Above Normal	143	106	410	1,208	2,575	2,155	614	140	136	140	140	136	7,904
Normal	140	99	328	360	630	502	181	140	136	140	140	136	2,931
Below Normal	140	97	106	289	395	424	143	140	136	140	140	136	2,287
Dry	140	97	100	275	380	349	144	140	136	140	140	136	2,177
All Years	141	101	367	1,220	2,329	1,758	771	151	136	140	140	136	7,390

Total Flow below Alameda/Calaveras Creek Confluence (MG)

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

	VBA_BASERH												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	26	1,129	5,619	8,442	5,445	2,802	100	10	4	1	1	23,579
Above Normal	4	22	506	2,292	3,906	2,201	476	34	7	2	1	0	9,452
Normal	0	9	455	489	1,028	517	93	19	3	1	0	0	2,614
Below Normal	0	7	25	61	110	147	23	13	2	0	0	0	389
Dry	0	2	8	11	40	23	14	7	0	0	0	0	107
All Years	1	13	421	1,682	2,688	1,654	671	35	5	1	0	0	7,172

Difference in Total Flow below Alameda/Calaveras Creek Confluence (MG)

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

	WSIP2018_CSRE_ACDD_RH_DT2300 minus VBA_BASERH												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	140	80	-222	-1,590	-672	-29	20	97	126	136	139	135	-1,640
Above Normal	139	84	-96	-1,085	-1,331	-45	138	107	129	138	140	135	-1,547
Normal	140	90	-127	-130	-398	-15	88	121	133	140	140	136	317
Below Normal	140	90	80	229	285	277	120	127	134	140	140	136	1,898
Dry	140	95	92	263	340	326	130	133	135	140	140	136	2,070
All Years	140	88	-54	-462	-359	103	100	117	131	139	140	136	218

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

Table 2-14 – Flow at Alameda/Calaveras Creek Confluence (MG) (Base Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	265	3,040	931	59	33	26	7	0	0	0	4,361
1922	0	0	250	80	8,752	3,364	72	15	3	0	0	0	12,537
1923	0	6	1,759	765	457	23	36	5	0	0	0	0	3,051
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	12	10	373	25	38	11	2	0	0	0	471
1926	0	0	0	1	5,096	18	245	2	0	0	0	0	5,362
1927	0	154	27	65	4,235	89	108	29	12	0	0	0	4,718
1928	0	0	186	43	126	3,779	575	7	2	1	0	0	4,719
1929	0	2	13	12	22	38	5	1	0	0	0	0	93
1930	0	0	6	56	35	1,164	19	12	8	0	0	0	1,299
1931	0	0	2	15	7	13	4	3	0	0	0	0	45
1932	0	0	546	82	171	25	17	9	3	0	0	0	852
1933	0	0	2	37	12	29	19	13	1	0	0	0	113
1934	0	0	46	152	68	31	9	5	1	0	0	0	312
1935	0	2	5	183	12	77	205	38	4	1	0	0	526
1936	0	0	5	35	3,496	60	61	23	4	1	0	0	3,685
1937	0	0	4	15	1,679	5,666	106	32	5	1	0	0	7,510
1938	0	1	180	105	11,999	8,382	291	39	8	3	1	0	21,009
1939	1	6	22	15	34	47	15	6	2	0	0	0	146
1940	0	0	1	200	8,618	4,495	795	32	6	2	1	0	14,151
1941	0	1	89	659	9,829	6,387	8,762	88	9	4	1	1	25,829
1942	1	4	183	4,338	5,665	546	2,051	74	7	2	1	0	12,872
1943	1	20	15	5,065	1,160	1,427	64	30	5	2	0	0	7,789
1944	0	3	6	11	116	134	32	19	3	0	0	0	324
1945	0	4	10	24	2,745	94	42	32	4	1	0	0	2,956
1946	0	6	1,765	621	53	46	38	24	4	1	0	0	2,557
1947	1	12	14	14	25	56	38	15	2	0	0	0	177
1948	0	1	5	5	7	41	65	31	2	0	0	0	156
1949	0	0	7	7	19	2,551	39	27	4	1	0	0	2,654
1950	0	0	4	92	178	32	26	13	2	0	0	0	346
1951	0	128	3,541	1,100	708	1,082	36	30	6	2	1	0	6,634
1952	0	2	203	11,398	3,588	6,502	96	34	8	3	1	0	21,834
1953	1	2	235	2,983	44	79	33	33	4	1	0	0	3,415
1954	0	8	4	49	165	98	45	19	3	0	0	0	391
1955	0	2	52	88	21	38	27	19	2	0	0	0	248
1956	0	0	11,021	7,452	4,861	116	47	25	8	3	1	0	23,533
1957	1	2	4	12	124	42	28	39	2	0	0	0	254
1958	0	2	14	187	7,543	7,963	13,162	74	9	4	1	1	28,959
1959	1	1	5	52	176	33	18	10	2	0	0	0	298
1960	0	0	2	13	271	14	11	8	1	0	0	0	319
1961	0	4	4	9	7	34	8	6	0	0	0	0	71
1962	0	0	3	4	1,791	112	26	20	3	0	0	0	1,958
1963	56	1	12	2,121	7,527	118	2,840	111	7	3	1	0	12,796
1964	2	25	9	180	12	22	17	11	1	0	0	0	279
1965	0	6	1,646	10,179	73	35	176	34	6	2	1	0	12,158
1966	1	26	57	46	67	34	7	8	2	0	0	0	246
1967	0	5	77	3,338	729	3,860	3,864	116	7	2	1	0	11,999
1968	1	2	10	192	60	64	33	19	2	0	0	0	382
1969	0	2	31	7,659	11,655	2,166	70	25	8	2	1	0	21,618
1970	1	2	12	2,921	57	984	27	14	3	1	0	0	4,020
1971	0	27	807	100	14	63	37	17	4	1	0	0	1,069
1972	0	0	47	14	29	10	7	3	0	0	0	0	111
1973	0	98	31	3,370	11,873	4,047	58	22	6	2	1	0	19,508
1974	3	51	997	3,035	25	1,161	2,949	37	10	5	1	0	8,274
1975	1	4	11	23	5,387	8,302	345	36	9	4	2	2	14,127
1976	2	3	3	3	4	14	6	3	0	0	0	0	36
1977	0	0	1	6	3	9	4	3	0	0	0	0	26
1978	0	0	15	4,314	2,970	4,041	115	31	8	2	1	0	11,497
1979	0	1	3	104	489	113	41	14	2	1	0	0	767
1980	0	4	38	3,586	13,732	648	59	24	7	3	1	0	18,101
1981	0	0	4	668	23	153	33	12	2	0	0	0	896
1982	0	36	163	5,282	3,626	1,734	11,542	83	9	3	1	0	22,479
1983	1	49	660	8,878	13,166	21,434	2,834	831	14	6	3	1	47,875
1984	3	106	3,689	40	21	38	33	29	4	1	0	0	3,964
1985	0	48	18	9	265	70	11	11	2	0	0	0	434
1986	0	1	6	6	13,885	7,744	78	28	7	2	1	0	21,758
1987	0	0	3	5	86	25	8	3	0	0	0	0	130
1988	0	0	11	21	5	6	7	3	0	0	0	0	54
1989	0	0	5	5	5	30	8	2	0	0	0	0	54
1990	0	5	4	12	14	13	7	5	0	0	0	0	59
1991	0	0	3	3	2	373	25	8	1	0	0	0	415
1992	0	0	6	9	2,287	75	31	11	3	0	0	0	2,422
1993	0	0	21	4,806	5,889	814	49	32	5	2	0	0	11,618
1994	0	1	10	8	140	23	16	14	1	0	0	0	214
1995	0	1	6	11,314	65	13,583	97	49	18	9	3	2	25,147
1996	1	1	25	3,370	11,588	4,243	47	33	10	3	1	1	19,324
1997	1	199	5,327	16,649	66	37	21	12	4	2	1	1	22,318
1998	1	12	34	5,679	22,795	1,975	1,792	78	32	15	7	4	32,421
1999	4	6	14	352	2,020	94	294	40	14	4	2	0	2,846
2000	0	3	4	442	4,383	2,398	34	19	5	2	0	1	7,291
2001	1	2	4	19	162	210	36	11	2	0	0	0	447
2002	0	2	182	49	23	84	24	11	2	0	0	0	378
Avg (21-02)	1	13	421	1,682	2,688	1,654	671	35	5	1	0	0	7,172
Max (21-02)	56	199	11,021	16,649	22,795	21,434	13,162	831	32	15	7	4	47,875
Min (21-02)	0	0	0	0	0	0	0	0	0	0	0	0	0

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

Table 2-15 – Flow at Alameda/Calaveras Creek Confluence (MG) (Revised 2018 WSIP Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	140	97	265	1,032	490	349	143	140	136	140	140	136	3,209
1922	140	97	254	275	7,629	3,331	143	140	136	141	140	136	12,561
1923	140	97	829	348	398	349	144	140	136	140	140	136	2,997
1924	138	97	100	275	362	349	144	140	136	140	140	136	2,157
1925	140	97	100	275	545	349	143	140	136	140	140	136	2,342
1926	140	97	100	274	1,703	349	303	140	136	140	140	136	3,660
1927	140	226	100	274	3,316	349	213	140	136	140	140	136	5,310
1928	140	97	255	275	424	2,516	524	140	136	140	140	136	4,923
1929	140	96	100	275	362	349	143	140	136	140	140	136	2,158
1930	140	97	100	275	362	1,304	143	140	136	140	140	136	3,113
1931	140	97	100	275	362	349	144	141	136	140	140	136	2,160
1932	140	97	546	274	375	349	144	140	135	141	140	136	2,617
1933	140	97	100	275	362	349	144	140	135	140	140	136	2,158
1934	140	97	100	361	362	349	144	140	136	140	140	136	2,245
1935	140	96	100	274	362	349	205	140	136	140	140	136	2,219
1936	140	97	100	275	1,535	349	143	140	136	140	140	136	3,331
1937	140	97	100	275	511	4,596	144	141	136	141	141	136	6,555
1938	140	96	185	274	11,057	8,349	240	140	135	140	140	136	21,034
1939	140	97	100	275	362	349	143	141	135	140	140	136	2,157
1940	140	97	100	291	5,445	4,462	745	141	136	140	140	136	11,972
1941	141	97	100	333	7,724	6,354	8,711	140	136	140	141	135	24,150
1942	140	97	183	2,534	5,020	761	2,099	141	136	141	140	136	11,526
1943	140	97	100	2,800	730	1,394	144	140	136	140	141	136	6,096
1944	141	96	100	275	362	374	144	140	135	141	140	136	2,184
1945	140	97	100	275	703	349	144	140	136	140	140	136	2,500
1946	140	97	249	274	362	349	143	140	136	140	140	136	2,307
1947	140	97	100	275	362	349	144	140	136	141	140	136	2,159
1948	140	97	100	274	362	349	144	140	135	140	140	136	2,158
1949	140	97	100	275	362	357	144	141	136	140	140	136	2,166
1950	140	97	100	275	437	349	143	140	135	140	140	136	2,233
1951	140	128	2,519	325	430	1,180	144	141	136	140	140	136	5,558
1952	140	97	203	8,967	3,569	6,469	144	140	136	140	140	136	20,281
1953	140	97	235	553	361	350	144	140	136	140	140	136	2,572
1954	140	97	100	275	429	349	144	140	136	141	140	136	2,226
1955	140	97	100	274	362	349	144	140	136	140	140	136	2,158
1956	140	97	8,649	7,436	4,842	349	144	141	135	140	140	136	22,349
1957	140	97	100	275	362	349	143	141	136	140	140	136	2,159
1958	140	96	100	371	6,624	7,930	13,111	140	136	140	141	135	29,065
1959	140	97	100	275	362	349	143	141	135	140	140	136	2,158
1960	140	97	100	275	545	349	143	141	135	140	140	136	2,341
1961	140	97	100	274	362	349	143	140	136	140	140	136	2,157
1962	140	97	100	275	836	349	143	140	136	141	140	136	2,632
1963	181	97	100	1,241	5,565	349	2,884	140	136	140	140	136	11,108
1964	140	97	101	370	362	349	143	140	136	140	140	136	2,254
1965	140	97	1,267	6,464	362	349	1,235	140	136	140	140	136	10,606
1966	140	97	100	275	362	349	143	140	135	140	140	136	2,157
1967	140	97	101	1,748	362	3,353	3,814	140	136	141	140	136	10,305
1968	140	97	100	344	362	349	144	140	136	140	140	136	2,227
1969	140	97	100	5,244	11,636	2,133	143	140	136	141	140	136	20,186
1970	140	97	101	801	362	616	143	140	136	140	140	136	2,950
1971	140	97	396	275	362	349	144	140	136	140	140	136	2,454
1972	140	97	102	275	364	349	144	141	136	140	140	136	2,163
1973	140	110	101	856	11,854	4,014	143	141	136	140	140	136	17,910
1974	140	97	739	1,677	362	1,632	2,889	140	136	140	140	136	8,228
1975	140	96	101	275	1,110	8,012	294	140	136	141	140	135	10,720
1976	140	96	100	275	361	349	143	140	136	140	140	136	2,157
1977	140	97	100	275	361	349	144	140	136	140	140	136	2,158
1978	140	97	100	1,306	583	3,380	144	140	136	141	140	136	6,441
1979	140	97	100	315	661	349	143	141	136	140	140	136	2,498
1980	141	97	100	1,268	11,783	615	143	140	135	140	140	136	14,838
1981	140	97	100	787	362	349	143	140	135	140	140	136	2,672
1982	140	97	194	2,868	3,607	1,701	11,492	140	135	141	140	136	20,791
1983	140	114	660	6,447	13,146	21,401	2,783	1,055	135	140	140	136	46,298
1984	140	130	2,563	274	361	349	144	140	136	140	140	136	4,654
1985	141	97	100	275	585	349	143	140	136	141	140	136	2,382
1986	140	97	100	274	9,811	7,711	144	140	136	141	140	136	18,969
1987	140	97	100	275	431	349	144	140	136	140	140	136	2,227
1988	140	97	100	275	362	349	144	141	136	140	140	136	2,159
1989	140	97	100	275	361	349	143	141	136	140	140	136	2,158
1990	140	97	100	275	362	349	143	140	136	140	140	136	2,158
1991	140	97	100	274	362	562	143	141	136	140	140	136	2,372
1992	140	97	100	275	945	349	144	140	136	141	140	136	2,742
1993	140	97	100	1,063	3,794	781	144	140	136	140	141	136	6,811
1994	141	97	100	275	407	349	144	141	135	140	140	136	2,205
1995	140	97	101	5,874	362	13,234	145	140	136	139	140	135	20,644
1996	140	97	100	1,686	10,638	4,210	143	140	136	141	140	135	17,707
1997	140	211	3,535	16,633	361	349	143	140	136	140	140	135	22,065
1998	140	97	100	3,335	22,570	1,942	1,741	140	135	140	140	135	30,615
1999	140	97	101	542	1,101	349	748	141	136	141	141	136	3,772
2000	141	96	100	659	1,322	1,569	143	142	136	141	141	136	4,725
2001	140	97	100	275	380	426	143	141	135	140	140	136	2,254
2002	140	97	197	275	361	349	144	140	136	140	140	136	2,255
Avg (21-02)	141	101	367	1,220	2,329	1,758	771	151	136	140	140	136	7,390
Max (21-02)	181	226	8,649	16,633	22,570	21,401	13,111	1,055	136	141	141	136	46,298
Min (21-02)	138	96	100	274	361	349	143	140	135	139	140	135	2,157

Table 2-16 – Difference in Flow at Alameda/Calaveras Creek Confluence (MG) (Revised 2018 WSIP minus Base Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	140	97	0	-2,008	-441	290	110	114	129	140	140	136	-1,152
1922	140	97	3	195	-1,124	-33	71	125	133	140	140	136	24
1923	140	91	-930	-416	-59	326	107	135	136	140	140	136	-54
1924	138	97	100	275	362	349	143	140	136	140	140	136	2,157
1925	140	97	88	265	172	324	105	129	134	140	140	136	1,871
1926	140	97	100	274	-3,393	331	58	138	136	140	140	136	-1,702
1927	140	72	73	210	-919	260	105	111	124	140	140	136	592
1928	140	97	69	232	298	-1,263	-51	133	134	139	140	136	204
1929	140	95	87	263	340	311	138	139	136	140	140	136	2,066
1930	140	97	94	219	327	140	124	128	140	140	140	136	1,814
1931	140	97	98	260	355	336	139	137	136	140	140	136	2,115
1932	140	97	0	193	204	324	126	131	133	140	140	136	1,765
1933	140	97	98	238	350	320	124	127	135	140	140	136	2,046
1934	140	97	54	209	294	318	134	135	135	140	140	136	1,933
1935	140	95	95	92	350	272	0	102	132	139	140	136	1,693
1936	140	97	95	240	-1,962	289	82	117	132	139	140	136	-354
1937	140	97	96	260	-1,169	-1,071	37	108	131	139	140	136	-955
1938	140	96	4	170	-942	-33	-51	101	128	137	139	136	26
1939	139	91	78	260	328	302	128	134	134	140	140	136	2,011
1940	140	97	99	91	-3,173	-33	-51	108	130	138	139	136	-2,178
1941	140	96	11	-326	-2,105	-33	-51	52	127	136	139	135	-1,679
1942	139	93	0	-1,804	-645	215	48	66	129	138	139	136	-1,346
1943	139	77	85	-2,265	-431	-33	79	110	131	138	140	136	-1,693
1944	140	94	94	264	246	240	111	121	133	140	140	136	1,860
1945	140	93	90	251	-2,042	255	101	108	132	139	140	136	-456
1946	140	91	-1,515	-346	309	303	105	116	132	139	140	136	-250
1947	139	85	86	261	337	293	105	125	134	140	140	136	1,982
1948	140	96	95	270	355	308	78	109	134	140	140	136	2,002
1949	140	97	93	268	343	-2,194	104	113	132	139	140	136	-488
1950	140	97	96	183	259	317	117	127	134	140	140	136	1,887
1951	140	0	-1,021	-775	-279	98	107	110	130	138	139	136	-1,077
1952	140	95	0	-2,430	-19	-33	47	106	128	137	139	136	-1,554
1953	139	95	0	-2,430	318	270	110	107	132	139	140	136	-843
1954	140	89	96	226	264	251	98	121	133	140	140	136	1,835
1955	140	95	48	187	341	311	116	121	134	140	140	136	1,910
1956	140	97	-2,372	-15	-19	233	96	115	128	137	139	136	-1,184
1957	139	95	96	263	238	307	115	101	134	140	140	136	1,905
1958	140	95	86	185	-919	-33	-51	66	127	136	139	135	106
1959	139	96	95	223	186	316	125	130	134	140	140	136	1,861
1960	140	97	98	262	274	335	132	132	135	140	140	136	2,022
1961	140	93	96	266	355	315	135	134	136	140	140	136	2,087
1962	140	97	97	271	-955	237	117	120	133	140	140	136	674
1963	124	96	88	-880	-1,962	231	44	29	129	137	139	136	-1,689
1964	138	72	91	190	350	327	126	129	135	140	140	136	1,975
1965	140	91	-379	-3,715	289	314	1,059	106	130	138	139	136	-1,552
1966	139	71	43	229	295	315	136	132	134	140	140	136	1,911
1967	140	92	23	-1,590	-367	-508	-51	24	129	138	139	136	-1,694
1968	139	95	90	152	302	285	110	121	134	140	140	136	1,845
1969	140	95	69	-2,414	-19	-33	73	115	128	138	139	136	-1,432
1970	139	95	88	-2,120	305	-368	116	126	133	139	140	136	-1,070
1971	140	70	-410	175	348	286	106	123	132	139	140	136	1,385
1972	140	97	54	261	335	339	136	137	136	140	140	136	2,052
1973	140	13	69	-2,514	-19	-33	85	118	130	138	139	136	-1,598
1974	137	46	-258	-1,357	337	471	-60	103	126	135	139	136	-45
1975	139	93	89	252	-4,278	-291	-51	104	127	136	138	134	-3,407
1976	138	94	97	272	358	335	137	137	136	140	140	136	2,121
1977	140	97	99	269	359	340	139	137	136	140	140	136	2,133
1978	140	97	85	-3,008	-2,387	-662	28	109	128	138	139	136	-5,055
1979	140	96	97	212	172	236	102	126	134	139	140	136	1,731
1980	140	93	62	-2,318	-1,948	-33	84	116	129	137	139	136	-3,262
1981	140	97	96	119	339	196	110	128	134	140	140	136	1,776
1982	140	61	31	-2,414	-19	-33	-51	57	127	137	139	136	-1,689
1983	139	65	0	-2,430	-19	-33	-51	224	122	134	137	135	-1,577
1984	137	24	-1,126	235	341	311	110	111	132	139	140	136	690
1985	140	49	82	266	321	279	132	129	134	140	140	136	1,949
1986	140	96	94	269	-4,074	-33	65	112	129	138	139	136	-2,789
1987	140	97	97	270	345	324	135	137	136	140	140	136	2,098
1988	140	97	89	254	357	343	136	137	136	140	140	136	2,106
1989	140	97	95	270	357	319	135	138	136	140	140	136	2,104
1990	140	92	96	263	348	336	136	135	136	140	140	136	2,099
1991	140	97	97	272	360	189	118	132	135	140	140	136	1,957
1992	140	97	94	266	-1,342	274	112	129	133	140	140	136	320
1993	140	97	79	-3,743	-2,095	-33	94	108	131	138	140	136	-4,807
1994	140	96	90	267	267	326	127	126	135	140	140	136	1,991
1995	140	96	94	-5,439	297	-349	47	91	118	130	137	134	-4,503
1996	139	96	75	-1,684	-951	-33	96	107	126	137	139	135	-1,617
1997	139	13	-1,792	-15	295	312	122	128	132	138	139	135	-253
1998	139	85	66	-2,344	-224	-33	-51	62	104	125	133	132	-1,806
1999	136	91	86	191	-919	255	454	100	122	136	138	136	926
2000	140	94	96	217	-3,061	-829	109	123	131	138	140	135	-2,566
2001	139	95	96	256	218	216	107	129	134	140	140	136	1,807
2002	140	95	15	226	338	265	119	129	134	140	140	136	1,878
Avg (21-02)	140	88	-54	-462	-359	103	100	117	131	139	140	136	218
Max (21-02)	140	97	100	275	362	471	1,059	224	136	140	140	136	2,157
Min (21-02)	124	0	-2,372	-5,439	-4,278	-2,194	-60	24	104	125	133	132	-5,055

Table 2-17
Contribution from Unregulated Inflows (MG) (Both Settings)

Unregulated Flow between ACDD and Calaveras Confluence (MG)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

											VBA_BASERH		WY Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Wet	0	17	112	329	387	321	196	58	10	4	2	1	1,437
Above Normal	2	15	79	195	253	183	101	34	7	2	1	0	871
Normal	0	7	74	88	126	107	52	20	3	1	0	0	476
Below Normal	0	7	20	46	77	72	24	13	2	0	0	0	261
Dry	0	2	8	11	22	23	14	7	1	0	0	0	89
All Years	1	10	58	133	173	141	77	26	5	1	0	0	625

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

Table 2-18
Contribution from Unregulated Inflows (MG) (Both Settings)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	125	311	169	59	33	26	7	0	0	0	730
1922	0	0	97	80	576	230	72	15	3	0	0	0	1,073
1923	0	0	188	141	94	23	36	5	0	0	0	0	493
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	12	10	190	25	38	11	2	0	0	0	288
1926	0	0	0	1	285	18	85	2	0	0	0	0	391
1927	0	25	27	65	273	89	91	29	12	0	0	0	611
1928	0	0	31	43	64	270	117	7	2	1	0	0	535
1929	0	2	13	12	22	38	5	1	0	0	0	0	93
1930	0	0	6	56	35	209	19	12	8	0	0	0	345
1931	0	0	2	15	7	13	4	3	0	0	0	0	44
1932	0	0	164	82	158	25	17	9	3	0	0	0	458
1933	0	0	2	37	12	29	19	13	1	0	0	0	113
1934	0	0	46	66	68	31	9	5	1	0	0	0	226
1935	0	2	5	183	12	77	164	38	4	1	0	0	486
1936	0	0	5	35	295	60	61	23	4	1	0	0	484
1937	0	0	4	15	239	333	106	32	5	1	0	0	735
1938	0	1	96	105	557	437	126	39	8	3	1	0	1,373
1939	1	6	22	15	34	47	15	6	2	0	0	0	148
1940	0	0	1	184	411	289	145	32	6	2	1	0	1,071
1941	0	1	89	211	426	361	449	88	9	4	1	1	1,640
1942	1	4	113	325	297	134	197	74	7	2	1	0	1,155
1943	1	20	15	350	135	171	64	30	5	2	0	0	793
1944	0	3	6	11	116	109	32	19	3	0	0	0	299
1945	0	4	10	24	271	94	42	32	4	1	0	0	482
1946	0	6	249	125	53	46	38	24	4	1	0	0	546
1947	1	12	14	14	25	56	38	15	2	0	0	0	177
1948	0	1	5	5	7	41	65	31	2	0	0	0	157
1949	0	0	7	7	19	294	39	27	4	1	0	0	398
1950	0	0	4	92	103	32	26	13	2	0	0	0	272
1951	0	128	297	140	114	154	36	30	6	2	1	0	908
1952	0	2	141	522	233	365	96	34	8	3	1	0	1,405
1953	1	2	165	244	44	79	33	33	4	1	0	0	606
1954	0	8	4	49	98	98	45	19	3	0	0	0	324
1955	0	2	52	88	21	38	27	19	2	0	0	0	249
1956	0	0	537	361	272	116	47	25	8	3	1	0	1,370
1957	1	2	4	12	124	42	28	39	2	0	0	0	254
1958	0	2	14	90	420	421	617	74	9	4	1	1	1,653
1959	1	1	5	52	176	33	18	10	2	0	0	0	298
1960	0	0	2	13	88	14	11	8	1	0	0	0	137
1961	0	4	4	9	7	34	8	6	0	0	0	0	72
1962	0	0	3	4	250	112	26	20	3	0	0	0	418
1963	16	1	12	261	355	118	227	111	7	3	1	0	1,112
1964	2	25	9	85	12	22	17	11	1	0	0	0	184
1965	0	6	267	444	73	35	176	34	6	2	1	0	1,044
1966	1	26	57	46	67	34	7	8	2	0	0	0	248
1967	0	5	77	298	119	264	262	116	7	2	1	0	1,151
1968	1	2	10	123	60	64	33	19	2	0	0	0	314
1969	0	2	31	431	482	200	70	25	8	2	1	0	1,252
1970	1	2	12	285	57	188	27	14	3	1	0	0	590
1971	0	27	214	100	14	63	37	17	4	1	0	0	477
1972	0	0	46	14	27	10	7	3	0	0	0	0	107
1973	0	84	31	296	483	269	58	22	6	2	1	0	1,252
1974	3	51	227	219	25	223	225	37	10	5	1	0	1,026
1975	1	4	11	23	353	433	128	36	9	4	2	2	1,006
1976	2	3	3	3	4	14	6	3	0	0	0	0	38
1977	0	0	1	6	3	9	4	3	0	0	0	0	26
1978	0	0	15	340	209	271	115	31	8	2	1	0	992
1979	0	1	3	63	190	113	41	14	2	1	0	0	428
1980	0	4	38	306	546	142	59	24	7	3	1	0	1,130
1981	0	0	4	156	23	153	33	12	2	0	0	0	383
1982	0	36	69	357	233	183	553	83	9	3	1	0	1,527
1983	1	32	153	448	528	934	223	151	14	6	3	1	2,494
1984	3	73	302	40	21	38	33	29	4	1	0	0	544
1985	0	48	18	9	41	70	11	11	2	0	0	0	210
1986	0	1	6	6	618	413	78	28	7	2	1	0	1,160
1987	0	0	3	5	17	25	8	3	0	0	0	0	61
1988	0	0	11	21	5	6	7	3	0	0	0	0	53
1989	0	0	5	5	5	30	8	2	0	0	0	0	55
1990	0	5	4	12	14	13	7	5	0	0	0	0	60
1991	0	0	3	3	2	160	25	8	1	0	0	0	202
1992	0	0	6	9	257	75	31	11	3	0	0	0	392
1993	0	0	21	344	304	148	49	32	5	2	0	0	905
1994	0	1	10	8	95	23	16	14	1	0	0	0	168
1995	0	1	6	511	65	665	96	49	18	9	3	2	1,425
1996	1	1	25	252	428	237	47	33	10	3	1	1	1,039
1997	1	84	358	643	66	37	21	12	4	2	1	1	1,230
1998	1	12	34	353	851	199	185	78	32	15	7	4	1,771
1999	4	6	14	84	231	94	136	40	14	4	2	0	629
2000	0	3	4	58	311	203	34	17	5	2	0	1	638
2001	1	2	4	19	144	133	36	11	2	0	0	0	352
2002	0	2	85	49	23	84	24	11	2	0	0	0	280
Avg (21-02)	1	10	58	133	173	141	77	26	5	1	0	0	625
Max (21-02)	16	128	537	643	851	934	617	151	32	15	7	4	2,494
Min (21-02)	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2-19
Recaptured In-Stream Release (MG) by Water Year Type

Total Recaptured In-Stream Release (MG) (Average within Year Type - Grouped by 5 Local Reservoir Runoff)													
	WSIP2018_CSRE_ACDD_RH_DT2300												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	140	80	38	43	52	71	40	83	126	136	139	135	1,083
Above Normal	139	84	56	101	119	110	54	107	129	138	140	135	1,313
Normal	140	90	63	188	236	238	93	121	133	140	140	136	1,717
Below Normal	140	90	80	229	285	277	120	127	134	140	140	136	1,898
Dry	140	95	92	263	340	326	130	133	135	140	140	136	2,070
All Years	140	88	66	165	207	204	87	114	131	139	140	136	1,616

Total Recaptured In-Stream Release (MG) (Average within Year Type - Grouped by 5 Local Reservoir Runoff)													
	VBA_BASERH												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	0	0	0	0	0	0	0	0	0

Difference in Total Recaptured In-Stream Release (MG) (Average within Year Type - Grouped by 5 Local Reservoir Runoff)													
	WSIP2018_CSRE_ACDD_RH_DT2300 minus VBA_BASERH												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	140	80	38	43	52	71	40	83	126	136	139	135	1,083
Above Normal	139	84	56	101	119	110	54	107	129	138	140	135	1,313
Normal	140	90	63	188	236	238	93	121	133	140	140	136	1,717
Below Normal	140	90	80	229	285	277	120	127	134	140	140	136	1,898
Dry	140	95	92	263	340	326	130	133	135	140	140	136	2,070
All Years	140	88	66	165	207	204	87	114	131	139	140	136	1,616

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

Table 2-20 Total Recaptured In-Stream Release (MG) - Revised WSIP 2018 Setting (note: zero for Baseline)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	140	97	0	0	193	290	110	114	129	140	140	136	1,490
1922	140	97	3	195	0	0	71	125	133	140	140	136	1,181
1923	140	91	0	134	268	326	107	135	136	140	140	136	1,754
1924	140	97	100	275	362	349	143	140	136	140	140	136	2,159
1925	140	97	88	265	172	324	105	129	134	140	140	136	1,871
1926	140	97	100	274	77	331	58	138	136	140	140	136	1,768
1927	140	72	73	210	0	260	52	111	124	140	140	136	1,459
1928	140	97	69	232	298	0	26	133	134	139	140	136	1,545
1929	140	95	87	263	340	311	138	139	136	140	140	136	2,066
1930	140	97	94	219	327	140	124	128	128	140	140	136	1,814
1931	140	97	98	260	355	336	139	137	136	140	140	136	2,115
1932	140	97	0	193	204	324	126	131	133	140	140	136	1,765
1933	140	97	98	238	350	320	124	127	135	140	140	136	2,046
1934	140	97	54	209	294	318	134	135	135	140	140	136	1,933
1935	140	95	95	92	350	272	0	102	132	139	140	136	1,693
1936	140	97	95	240	67	289	82	117	132	139	140	136	1,675
1937	140	97	96	260	123	0	37	108	131	139	140	136	1,408
1938	140	96	4	170	0	0	17	101	128	137	139	136	1,069
1939	139	91	78	260	328	302	128	134	134	140	140	136	2,011
1940	140	97	99	91	0	0	0	108	130	138	139	136	1,078
1941	140	96	11	64	0	0	0	52	127	136	139	135	900
1942	139	93	0	0	0	215	0	66	129	138	139	136	1,055
1943	139	77	85	0	227	0	79	110	131	138	140	136	1,263
1944	140	94	94	264	246	240	111	121	133	140	140	136	1,860
1945	140	93	90	251	91	255	101	108	132	139	140	136	1,677
1946	140	91	0	150	309	303	105	116	132	139	140	136	1,762
1947	139	85	86	261	337	293	105	125	134	140	140	136	1,982
1948	140	96	95	270	355	308	78	109	134	140	140	136	2,002
1949	140	97	93	268	343	55	104	113	132	139	140	136	1,761
1950	140	97	96	183	259	317	117	127	134	140	140	136	1,887
1951	140	0	0	135	248	0	107	110	130	138	139	136	1,284
1952	140	95	0	0	0	0	47	106	128	137	139	136	929
1953	139	95	0	31	318	270	110	107	132	139	140	136	1,618
1954	140	89	96	226	264	251	98	121	133	140	140	136	1,835
1955	140	95	48	187	341	311	116	121	134	140	140	136	1,910
1956	140	97	0	0	0	233	96	115	128	137	139	136	1,222
1957	139	95	96	263	238	307	115	101	134	140	140	136	1,905
1958	140	95	86	185	0	0	0	66	127	136	139	135	1,109
1959	139	96	95	223	186	316	125	130	134	140	140	136	1,861
1960	140	97	98	262	274	335	132	132	135	140	140	136	2,022
1961	140	93	96	266	355	315	135	134	136	140	140	136	2,087
1962	140	97	97	271	112	237	117	120	133	140	140	136	1,741
1963	124	96	88	14	0	231	0	29	129	137	139	136	1,123
1964	138	72	91	190	350	327	126	129	135	140	140	136	1,975
1965	140	91	0	0	289	314	0	106	130	138	139	136	1,483
1966	139	71	43	229	295	315	136	132	134	140	140	136	1,911
1967	140	92	23	0	243	0	0	24	129	138	139	136	1,065
1968	139	95	90	152	302	285	110	121	134	140	140	136	1,845
1969	140	95	69	0	0	0	73	115	128	138	139	136	1,034
1970	139	95	88	0	305	161	116	126	133	139	140	136	1,579
1971	140	70	0	175	348	286	106	123	132	139	140	136	1,796
1972	140	97	54	261	335	339	136	137	136	140	140	136	2,052
1973	140	13	69	0	0	0	85	118	130	138	139	136	969
1974	137	46	0	0	337	0	0	103	126	135	139	136	1,159
1975	139	93	89	252	9	0	15	104	127	136	138	134	1,237
1976	138	94	97	272	358	335	137	137	136	140	140	136	2,121
1977	140	97	99	269	359	340	139	137	136	140	140	136	2,133
1978	140	97	85	0	153	0	28	109	128	138	139	136	1,154
1979	140	96	97	212	172	236	102	126	134	139	140	136	1,731
1980	140	93	62	0	0	207	84	116	129	137	139	136	1,244
1981	140	97	96	119	339	196	110	128	134	140	140	136	1,776
1982	140	61	31	0	0	166	0	57	127	137	139	136	995
1983	139	65	0	0	0	0	0	0	122	134	137	135	732
1984	137	24	0	235	341	311	110	111	132	139	140	136	1,817
1985	140	49	82	266	321	279	132	129	134	140	140	136	1,949
1986	140	96	94	269	0	0	65	112	129	138	139	136	1,319
1987	140	97	97	270	345	324	135	137	136	140	140	136	2,098
1988	140	97	89	254	357	343	136	137	136	140	140	136	2,106
1989	140	97	95	270	357	319	135	138	136	140	140	136	2,104
1990	140	92	96	263	348	336	136	135	136	140	140	136	2,099
1991	140	97	97	272	360	189	118	132	135	140	140	136	1,957
1992	140	97	94	266	105	274	112	129	133	140	140	136	1,767
1993	140	97	79	0	0	201	94	108	131	138	140	136	1,265
1994	140	96	90	267	267	326	127	126	135	140	140	136	1,991
1995	140	96	94	0	297	0	47	91	118	131	137	134	1,286
1996	139	96	75	23	0	0	96	107	126	137	139	135	1,074
1997	139	13	0	0	296	312	122	128	132	138	139	135	1,555
1998	139	85	66	0	0	0	0	62	104	125	133	132	847
1999	136	91	86	191	131	255	7	100	122	136	138	136	1,530
2000	140	94	96	217	51	0	109	123	131	138	140	135	1,375
2001	139	95	96	256	218	216	107	129	134	140	140	136	1,807
2002	140	95	15	226	339	265	119	129	134	140	140	136	1,879
Avg (21-02)	140	88	66	165	207	204	87	114	131	139	140	136	1,616
Max (21-02)	140	97	100	275	362	349	143	140	136	140	140	136	2,159
Min (21-02)	124	0	0	0	0	0	0	0	104	125	133	132	732

Table 2-21
Alameda Creek Flow above San Antonio Confluence (MG) by Water Year Type

Alameda Creek Flow abv San Antonio Confluence

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

WSIP2018_CSRE_ACDD_RH_DT2300

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	2	50	1,034	4,465	8,293	5,758	3,029	181	25	11	5	3	22,857
Above Normal	6	49	474	1,373	2,808	2,277	690	71	18	7	3	2	7,778
Normal	2	21	368	296	575	401	151	42	9	3	1	1	1,871
Below Normal	2	18	60	132	221	234	50	30	7	2	1	1	756
Dry	2	6	23	32	75	47	30	16	3	1	1	1	236
All Years	3	29	389	1,247	2,373	1,732	780	67	12	5	2	1	6,640

Alameda Creek Flow abv San Antonio Confluence

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

VBA_BASERH

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	2	50	1,295	6,098	9,017	5,858	3,049	167	25	11	5	3	25,580
Above Normal	6	49	626	2,559	4,258	2,433	607	71	18	7	3	2	10,638
Normal	2	21	559	613	1,209	654	156	42	9	3	1	1	3,271
Below Normal	2	18	60	132	221	234	50	30	7	2	1	1	756
Dry	2	6	23	32	75	47	30	16	3	1	1	1	236
All Years	3	29	508	1,873	2,939	1,833	767	65	12	5	2	1	8,038

Difference in Alameda Creek Flow abv San Antonio Confluence

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

WSIP2018_CSRE_ACDD_RH_DT2300 minus VBA_BASERH

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-260	-1,633	-724	-100	-20	14	0	0	0	0	-2,723
Above Normal	0	0	-152	-1,186	-1,450	-156	84	0	0	0	0	0	-2,860
Normal	0	0	-191	-317	-634	-253	-5	0	0	0	0	0	-1,399
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-120	-626	-566	-101	12	3	0	0	0	0	-1,397

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

Table 2-22 – Alameda Creek Flow above San Antonio Confluence (MG) (Base Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	1	14	495	3,366	1,104	107	53	39	11	3	1	1	5,196
1922	1	2	381	160	9,425	3,677	182	45	10	4	2	1	13,892
1923	2	21	2,099	945	609	54	136	19	7	3	1	1	3,897
1924	1	0	0	0	0	0	1	0	0	0	0	0	1
1925	0	1	40	37	623	43	75	49	6	1	1	1	877
1926	1	1	2	28	5,591	56	384	12	6	2	1	1	6,085
1927	1	266	64	162	4,696	215	267	48	20	3	2	1	5,744
1928	2	2	258	80	195	4,222	744	24	3	3	1	1	5,536
1929	1	3	77	61	72	110	35	9	4	1	1	1	377
1930	1	1	8	121	101	1,435	41	22	10	2	1	1	1,743
1931	2	2	6	43	18	27	9	7	2	1	1	1	118
1932	1	1	769	201	386	51	36	18	8	2	1	1	1,475
1933	2	2	5	100	34	60	41	27	3	1	1	1	277
1934	1	1	120	252	170	64	19	9	5	1	1	1	644
1935	1	6	13	429	35	168	409	80	11	3	1	1	1,157
1936	2	2	14	96	3,908	127	128	48	11	3	1	1	4,342
1937	2	2	10	43	1,999	6,095	235	68	13	5	2	1	8,473
1938	2	3	318	252	12,843	8,948	445	82	20	8	4	2	22,927
1939	5	15	60	43	93	98	31	13	6	2	1	1	368
1940	1	1	4	448	9,220	4,865	975	68	16	6	3	2	15,608
1941	2	5	218	940	10,456	6,852	9,343	192	23	10	4	3	28,048
1942	4	12	341	4,799	6,080	711	2,299	161	18	7	3	2	14,437
1943	3	48	41	5,567	1,347	1,640	138	63	14	5	2	1	8,871
1944	3	8	17	32	278	265	68	39	8	2	1	1	722
1945	1	12	28	68	3,117	206	88	67	11	3	1	1	3,604
1946	1	16	2,101	794	136	97	79	50	11	3	1	1	3,291
1947	3	30	38	39	70	119	80	31	8	2	1	1	422
1948	1	4	14	14	19	85	139	65	6	2	1	1	350
1949	1	1	19	20	53	2,928	82	57	11	3	1	1	3,177
1950	1	1	11	225	324	67	53	27	6	1	1	1	719
1951	1	297	3,956	1,292	868	1,274	76	63	16	6	3	1	7,854
1952	2	7	395	12,184	3,898	6,973	211	70	20	8	4	2	23,775
1953	4	7	459	3,311	115	173	69	69	11	3	2	1	4,225
1954	2	20	11	127	305	217	94	39	9	2	1	1	828
1955	1	6	134	214	60	79	57	39	7	2	1	1	600
1956	1	2	11,832	7,971	5,236	257	98	53	20	8	4	2	25,484
1957	5	6	11	34	296	88	58	82	7	2	1	1	592
1958	1	6	38	316	8,161	8,508	13,966	160	24	10	5	3	31,195
1959	4	5	13	134	414	69	37	22	6	1	1	1	707
1960	1	1	5	36	399	29	22	17	3	1	1	1	516
1961	1	11	11	24	19	70	16	12	3	1	1	1	170
1962	1	1	9	11	2,128	248	53	41	9	2	1	1	2,506
1963	58	4	33	2,477	8,038	262	3,128	245	19	7	3	2	14,277
1964	5	60	26	303	33	46	35	23	5	1	1	1	540
1965	1	15	2,012	10,837	182	73	397	71	16	6	3	2	13,614
1966	3	62	144	121	167	71	14	16	6	1	1	1	607
1967	1	13	191	3,755	894	4,198	4,199	257	18	7	3	2	13,538
1968	4	6	27	363	151	137	69	39	8	2	1	1	807
1969	1	8	87	8,295	12,375	2,418	151	51	20	7	3	2	23,417
1970	4	6	35	3,316	144	1,220	55	29	9	3	2	1	4,825
1971	1	64	1,092	242	39	133	78	35	12	3	1	1	1,703
1972	2	3	122	41	78	21	15	7	2	1	0	0	291
1973	1	209	87	3,784	12,596	4,390	123	46	16	6	3	2	21,262
1974	9	120	1,299	3,326	71	1,443	3,234	77	25	13	4	1	9,623
1975	5	10	32	65	5,894	8,863	502	75	23	12	6	5	15,492
1976	6	8	9	9	10	30	12	5	1	1	1	1	92
1977	2	2	4	16	7	18	9	6	1	1	0	0	67
1978	0	1	41	4,799	3,248	4,388	256	64	21	7	3	2	12,831
1979	2	5	8	199	744	250	86	30	7	3	1	1	1,335
1980	3	12	102	4,015	14,556	823	125	50	17	8	3	2	19,717
1981	2	3	12	881	64	344	69	25	6	1	1	1	1,409
1982	1	86	266	5,796	3,937	1,963	12,262	180	22	9	4	2	24,527
1983	3	94	868	9,542	13,961	22,656	3,116	1,019	34	15	7	4	51,319
1984	9	203	4,112	106	58	79	70	60	12	4	2	1	4,716
1985	2	112	51	25	332	150	23	23	7	2	1	1	729
1986	1	5	16	16	14,830	8,278	170	58	18	7	3	1	23,402
1987	2	2	9	15	116	51	17	6	2	1	1	0	221
1988	1	2	31	60	14	12	15	7	2	1	1	0	145
1989	1	1	13	15	13	62	16	5	2	1	1	0	130
1990	1	13	11	33	39	28	14	10	2	1	1	0	154
1991	1	1	8	7	6	573	52	18	5	1	1	1	674
1992	1	1	17	25	2,637	162	65	22	9	2	1	1	2,943
1993	1	1	60	5,297	6,316	998	103	67	14	5	2	1	12,867
1994	3	5	28	22	277	47	34	30	4	1	1	1	454
1995	0	5	18	12,082	164	14,449	212	101	44	22	9	6	27,113
1996	5	4	71	3,712	12,220	4,544	97	69	26	9	3	3	20,764
1997	5	310	5,844	17,633	166	78	44	24	11	5	3	3	24,125
1998	4	29	92	6,187	24,122	2,226	2,024	169	75	36	17	10	34,991
1999	11	17	40	473	2,326	207	463	84	35	11	7	2	3,678
2000	3	8	11	531	4,822	2,655	70	38	14	7	2	4	8,165
2001	4	7	12	53	360	374	75	24	6	2	1	1	919
2002	1	6	305	128	65	184	50	23	7	1	1	0	772
Avg (21-02)	3	29	508	1,873	2,939	1,833	767	65	12	5	2	1	8,038
Max (21-02)	58	310	11,832	17,633	24,122	22,656	13,966	1,019	75	36	17	10	51,319
Min (21-02)	0	0	0	0	0	0	1	0	0	0	0	0	1

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

Table 2-23 – Alameda Creek Flow above San Antonio Confluence (MG) (Revised WSIP 2018 Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	1	14	495	1,358	470	107	53	39	11	3		1	2,553
1922	1	2	381	160	8,301	3,644	182	45	10	4	2	1	12,735
1923	2	21	1,168	395	282	54	136	19	7	3	1	1	2,090
1924	-1	0	0	0	0	0	1	0	0	0	0	0	-1
1925	0	1	40	37	623	43	75	49	6	1	1	1	877
1926	1	1	2	28	2,121	56	384	12	6	2	1	1	2,616
1927	1	266	64	162	3,777	215	320	48	20	3	2	1	4,878
1928	2	2	258	80	195	2,959	667	24	3	3	1	1	4,195
1929	1	3	77	61	72	110	35	9	4	1	1	1	377
1930	1	1	8	121	101	1,435	41	22	10	2	1	1	1,743
1931	2	2	6	43	18	27	9	7	2	1	1	1	118
1932	1	1	769	201	386	51	36	18	8	2	1	1	1,475
1933	2	2	5	100	34	60	41	27	3	1	1	1	277
1934	1	1	120	252	170	64	19	9	5	1	1	1	644
1935	1	6	13	429	35	168	409	80	11	3	1	1	1,157
1936	2	2	14	96	1,879	127	128	48	11	3	1	1	2,313
1937	2	2	10	43	707	5,024	235	68	13	5	2	1	6,111
1938	2	3	318	252	11,901	8,915	377	82	20	8	4	2	21,884
1939	5	15	60	43	93	98	31	13	6	2	1	1	368
1940	1	1	4	448	6,047	4,832	924	68	16	6	3	2	12,351
1941	2	5	218	550	8,351	6,819	9,293	192	23	10	4	3	25,469
1942	4	12	341	2,994	5,435	711	2,347	161	18	7	3	2	12,035
1943	3	48	41	3,302	689	1,607	138	63	14	5	2	1	5,915
1944	3	8	17	32	278	265	68	39	8	2	1	1	722
1945	1	12	28	68	985	206	88	67	11	3	1	1	1,471
1946	1	16	585	298	136	97	79	50	11	3	1	1	1,279
1947	3	30	38	39	70	119	80	31	8	2	1	1	422
1948	1	4	14	14	19	85	139	65	6	2	1	1	350
1949	1	1	19	20	53	679	82	57	11	3	1	1	929
1950	1	1	11	225	324	67	53	27	6	1	1	1	719
1951	1	297	2,935	382	342	1,372	76	63	16	6	3	1	5,494
1952	2	7	395	9,753	3,878	6,940	211	70	20	8	4	2	21,292
1953	4	7	459	850	115	173	69	69	11	3	2	1	1,764
1954	2	20	11	127	305	217	94	39	9	2	1	1	828
1955	1	6	134	214	60	79	57	39	7	2	1	1	600
1956	1	2	9,460	7,956	5,217	257	98	53	20	8	4	2	23,078
1957	5	6	11	34	296	88	58	82	7	2	1	1	592
1958	1	6	38	316	7,242	8,475	13,915	160	24	10	5	3	30,192
1959	4	5	13	134	414	69	37	22	6	1	1	1	707
1960	1	1	5	36	399	29	22	17	3	1	1	1	516
1961	1	11	11	24	19	70	16	12	3	1	1	1	170
1962	1	1	9	11	1,061	248	53	41	9	2	1	1	1,439
1963	58	4	33	1,583	6,076	262	3,172	245	19	7	3	2	11,465
1964	5	60	26	303	33	46	35	23	5	1	1	1	540
1965	1	15	1,633	7,122	182	73	1,456	71	16	6	3	2	10,579
1966	3	62	144	121	167	71	14	16	6	1	1	1	607
1967	1	13	191	2,165	284	3,690	4,148	257	18	7	3	2	10,779
1968	4	6	27	363	151	137	69	39	8	2	1	1	807
1969	1	8	87	5,881	12,355	2,385	151	51	20	7	3	2	20,951
1970	4	6	35	1,196	144	691	55	29	9	3	2	1	2,176
1971	1	64	682	242	39	133	78	35	12	3	1	1	1,293
1972	2	3	122	41	78	21	15	7	2	1	0	0	291
1973	1	209	87	1,270	12,576	4,357	123	46	16	6	3	2	18,696
1974	9	120	1,041	1,969	71	1,914	3,174	77	25	13	4	1	8,418
1975	5	10	32	65	1,607	8,573	435	75	23	12	6	5	10,848
1976	6	8	9	9	10	30	12	5	1	1	1	1	92
1977	2	2	4	16	7	18	9	6	1	1	0	0	67
1978	0	1	41	1,792	708	3,727	256	64	21	7	3	2	6,622
1979	2	5	8	199	744	250	86	30	7	3	1	1	1,335
1980	3	12	102	1,697	12,608	583	125	50	17	8	3	2	15,210
1981	2	3	12	881	64	344	69	25	6	1	1	1	1,409
1982	1	86	266	3,382	3,918	1,764	12,211	180	22	9	4	2	21,844
1983	3	94	868	7,111	13,941	22,623	3,065	1,243	34	15	7	4	49,009
1984	9	203	2,986	106	58	79	70	60	12	4	2	1	3,590
1985	2	112	51	25	332	150	23	23	7	2	1	1	729
1986	1	5	16	16	10,756	8,245	170	58	18	7	3	1	19,295
1987	2	2	9	15	116	51	17	6	2	1	1	0	221
1988	1	2	31	60	14	12	15	7	2	1	1	0	145
1989	1	1	13	15	13	62	16	5	2	1	1	0	130
1990	1	13	11	33	39	28	14	10	2	1	1	0	154
1991	1	1	8	7	6	573	52	18	5	1	1	1	674
1992	1	1	17	25	1,190	162	65	22	9	2	1	1	1,497
1993	1	1	60	1,554	4,221	764	103	67	14	5	2	1	6,794
1994	3	5	28	22	277	47	34	30	4	1	1	1	454
1995	0	5	18	6,643	164	14,100	212	101	44	21	9	6	21,324
1996	5	4	71	2,004	11,270	4,511	97	69	26	9	3	3	18,073
1997	5	310	4,052	17,618	165	78	44	24	11	5	3	3	22,318
1998	4	29	92	3,843	23,898	2,193	1,973	169	75	36	17	10	32,338
1999	11	17	40	473	1,276	207	909	84	35	11	7	2	3,074
2000	3	8	11	531	1,710	1,826	70	38	14	7	2	4	4,224
2001	4	7	12	53	360	374	75	24	6	2	1	1	919
2002	1	6	305	128	64	184	50	23	7	1	1	0	771
Avg (21-02)	3	29	389	1,247	2,373	1,732	780	67	12	5	2	1	6,640
Max (21-02)	58	310	9,460	17,618	23,898	22,623	13,915	1,243	75	36	17	10	49,009
Min (21-02)	-1	0	0	0	0	0	1	0	0	0	0	0	-1

Table 2-24 – Difference in Alameda Creek Flow above San Antonio Confluence (MG) (Revised 2018 WSIP minus Base Setting)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	-2,008	-634	0	0	0	0	0	0	0	-2,642
1922	0	0	0	0	-1,124	-33	0	0	0	0	0	0	-1,157
1923	0	0	-930	-550	-327	0	0	0	0	0	0	0	-1,808
1924	-2	0	0	0	0	0	0	0	0	0	0	0	-2
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	-3,470	0	0	0	0	0	0	0	-3,470
1927	0	0	0	0	-919	0	53	0	0	0	0	0	-866
1928	0	0	0	0	0	-1,263	-77	0	0	0	0	0	-1,340
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-2,028	0	0	0	0	0	0	0	-2,028
1937	0	0	0	0	-1,292	-1,071	0	0	0	0	0	0	-2,362
1938	0	0	0	0	-942	-33	-68	0	0	0	0	0	-1,043
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-3,173	-33	-51	0	0	0	0	0	-3,257
1941	0	0	0	-390	-2,105	-33	-51	0	0	0	0	0	-2,579
1942	0	0	0	-1,804	-645	0	48	0	0	0	0	0	-2,401
1943	0	0	0	-2,265	-658	-33	0	0	0	0	0	0	-2,956
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-2,133	0	0	0	0	0	0	0	-2,133
1946	0	0	-1,515	-496	0	0	0	0	0	0	0	0	-2,012
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	-2,249	0	0	0	0	0	0	-2,249
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-1,021	-910	-527	98	0	0	0	0	0	0	-2,360
1952	0	0	0	-2,430	-19	-33	0	0	0	0	0	0	-2,483
1953	0	0	0	-2,461	0	0	0	0	0	0	0	0	-2,461
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-2,372	-15	-19	0	0	0	0	0	0	0	-2,406
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	-919	-33	-51	0	0	0	0	0	-1,003
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	-1,067	0	0	0	0	0	0	0	-1,067
1963	0	0	0	-894	-1,962	0	44	0	0	0	0	0	-2,812
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	-379	-3,715	0	0	1,059	0	0	0	0	0	-3,035
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	-1,590	-610	-508	-51	0	0	0	0	0	-2,759
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-2,414	-19	-33	0	0	0	0	0	0	-2,466
1970	0	0	0	-2,120	0	-529	0	0	0	0	0	0	-2,649
1971	0	0	-410	0	0	0	0	0	0	0	0	0	-410
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	-2,514	-19	-33	0	0	0	0	0	0	-2,567
1974	0	0	-258	-1,357	0	471	-60	0	0	0	0	0	-1,205
1975	0	0	0	0	-4,287	-291	-66	0	0	0	0	0	-4,643
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	-3,008	-2,540	-662	0	0	0	0	0	0	-6,209
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	-2,318	-1,948	-240	0	0	0	0	0	0	-4,507
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-2,414	-19	-199	-51	0	0	0	0	0	-2,683
1983	0	0	0	-2,430	-19	-33	-51	224	0	0	0	0	-2,310
1984	0	0	-1,126	0	0	0	0	0	0	0	0	0	-1,126
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-4,074	-33	0	0	0	0	0	0	-4,107
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	-1,447	0	0	0	0	0	0	0	-1,447
1993	0	0	0	-3,743	-2,095	-234	0	0	0	0	0	0	-6,072
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	-5,439	0	-349	0	0	0	-1	0	0	-5,789
1996	0	0	0	-1,707	-951	-33	0	0	0	0	0	0	-2,691
1997	0	0	-1,792	-15	-1	0	0	0	0	0	0	0	-1,808
1998	0	0	0	-2,344	-224	-33	-51	0	0	0	0	0	-2,652
1999	0	0	0	0	-1,050	0	446	0	0	0	0	0	-604
2000	0	0	0	0	-3,112	-829	0	0	0	0	0	0	-3,941
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	-1	0	0	0	0	0	0	0	-1
Avg (21-02)	0	0	-120	-626	-566	-101	12	3	0	0	0	0	-1,397
Max (21-02)	0	0	0	0	0	471	1,059	224	0	0	0	0	0
Min (21-02)	-2	0	-2,372	-5,439	-4,287	-2,249	-77	0	0	-1	0	0	-6,209

Table 2-25
Difference in Calaveras Reservoir Storage (MG) by Water Year Type

Calaveras Reservoir Storage (MG)

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

									WSIP2018_CSRE_ACDD_RH_DT2300			
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	27,969	26,776	27,217	30,378	31,338	31,465	31,477	31,472	30,985	30,673	30,320	29,844
Above Normal	27,477	26,052	26,495	29,097	31,138	31,420	31,500	31,493	31,182	30,828	30,456	29,964
Normal	26,723	25,431	25,916	26,978	28,858	30,378	30,707	30,717	30,436	30,047	29,661	29,287
Below Normal	27,247	25,662	25,314	26,284	27,759	28,862	29,038	29,032	28,756	28,365	27,982	27,627
Dry	26,745	25,617	25,275	25,372	25,608	25,685	25,740	25,592	25,292	24,911	24,541	24,205
All Years	27,235	25,907	26,040	27,624	28,952	29,576	29,707	29,676	29,346	28,980	28,607	28,200

Calaveras Reservoir Storage (MG)

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

									VBA_BASERH			
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	10,150	10,222	10,645	12,000	12,308	12,253	12,292	12,299	11,880	11,694	11,441	10,936
Above Normal	10,147	10,151	10,826	11,616	12,274	11,967	12,280	12,299	11,999	11,773	11,495	10,954
Normal	10,200	10,192	10,758	10,986	11,355	11,110	11,789	11,937	11,802	11,548	11,278	10,837
Below Normal	10,171	10,163	10,222	10,290	10,560	10,440	10,882	11,087	10,949	10,698	10,488	10,324
Dry	10,079	10,079	10,131	10,246	10,244	10,266	10,496	10,546	10,398	10,214	10,053	9,912
All Years	10,150	10,161	10,516	11,026	11,350	11,207	11,548	11,635	11,407	11,187	10,952	10,594

Difference in Calaveras Reservoir Storage (MG)

(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

									WSIP2018_CSRE_ACDD_RH_DT2300 minus VBA_BASERH			
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	17,818	16,554	16,572	18,378	19,031	19,212	19,185	19,172	19,105	18,979	18,879	18,908
Above Normal	17,329	15,902	15,669	17,481	18,864	19,453	19,220	19,195	19,183	19,055	18,961	19,010
Normal	16,523	15,240	15,158	15,992	17,503	19,268	18,918	18,780	18,634	18,500	18,383	18,450
Below Normal	17,076	15,499	15,092	15,995	17,198	18,423	18,156	17,945	17,806	17,667	17,493	17,303
Dry	16,667	15,539	15,144	15,126	15,364	15,418	15,245	15,046	14,894	14,696	14,488	14,293
All Years	17,086	15,745	15,524	16,598	17,603	18,369	18,158	18,041	17,938	17,794	17,655	17,607

Table 2-26 Calaveras Reservoir Storage (MG) - Baseline Setting

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	10,300	10,300	11,731	12,400	12,400	10,472	10,793	10,935	10,784	10,533	10,327	10,217
1922	10,157	10,139	10,300	10,300	12,400	12,400	12,400	12,395	12,015	11,774	11,569	11,000
1923	10,300	10,300	12,400	12,400	12,400	10,164	11,991	12,146	12,015	11,756	11,541	11,000
1924	10,300	10,258	10,233	10,212	10,186	10,060	9,998	9,895	9,676	9,525	9,383	9,265
1925	9,193	9,170	9,690	10,182	12,223	10,300	10,942	11,570	11,405	11,133	10,914	10,795
1926	10,300	10,274	10,285	10,300	12,400	10,275	12,400	12,400	12,260	11,992	11,670	11,000
1927	10,300	10,300	10,300	10,300	12,400	11,909	12,400	12,400	12,283	12,027	11,683	11,000
1928	10,300	10,287	10,300	10,300	10,300	12,400	12,400	12,400	12,177	11,915	11,647	11,000
1929	10,300	10,283	10,300	10,300	10,300	10,300	10,809	10,863	10,712	10,440	10,224	10,108
1930	10,038	10,012	10,032	10,300	10,300	11,677	12,023	12,104	11,913	11,640	11,418	11,000
1931	10,300	10,284	10,300	10,300	10,300	10,288	10,310	10,274	10,089	9,947	9,812	9,700
1932	9,629	9,604	10,654	10,300	11,836	10,589	10,589	10,659	10,630	10,371	10,161	10,050
1933	9,995	9,983	10,023	10,300	10,092	10,300	10,639	10,806	10,636	10,365	10,152	10,039
1934	9,968	9,944	10,300	10,300	10,300	10,300	10,422	10,409	10,257	10,118	9,984	9,871
1935	9,806	9,830	9,968	11,855	10,300	10,300	12,400	12,400	11,741	11,482	11,270	11,000
1936	10,300	10,289	10,300	10,300	12,400	10,846	12,071	12,400	12,299	12,036	11,685	11,000
1937	10,300	10,283	10,300	10,300	12,400	12,400	12,400	12,400	12,035	11,787	11,579	11,000
1938	10,300	10,300	10,300	10,305	12,400	12,400	12,400	12,400	12,056	11,838	11,630	11,000
1939	10,300	10,300	10,300	10,300	10,300	10,300	10,547	10,575	10,432	10,169	9,961	9,851
1940	9,782	9,757	9,777	11,674	12,400	12,400	12,400	12,400	12,044	11,810	11,608	11,000
1941	10,300	10,300	10,300	12,400	12,400	12,400	12,400	12,400	11,788	11,587	11,402	11,000
1942	10,300	10,300	10,432	12,400	12,400	12,301	12,400	12,400	11,770	11,544	11,347	11,000
1943	10,300	10,300	10,300	12,400	12,400	12,400	12,400	12,400	12,318	12,072	11,698	11,000
1944	10,300	10,300	10,300	10,300	10,855	10,511	11,117	11,401	11,277	11,013	10,800	10,684
1945	10,300	10,300	10,300	10,300	12,400	11,702	12,400	12,400	12,303	12,041	11,687	11,000
1946	10,300	10,300	12,400	12,400	11,438	10,300	11,019	11,404	11,310	11,055	10,847	10,733
1947	10,300	10,300	10,300	10,300	10,300	10,300	11,043	11,247	11,120	10,857	10,647	10,535
1948	10,300	10,300	10,300	10,300	10,300	10,300	11,652	12,186	12,031	11,756	11,536	11,000
1949	10,300	10,281	10,300	10,300	10,300	12,400	12,400	12,400	12,298	12,033	11,684	11,000
1950	10,300	10,278	10,300	10,300	10,468	10,300	10,762	10,920	10,774	10,506	10,293	10,178
1951	10,111	10,300	12,400	12,400	12,400	12,400	12,400	12,400	12,323	12,083	11,700	11,000
1952	10,300	10,300	11,101	12,400	12,400	12,400	12,400	12,400	12,057	11,842	11,632	11,000
1953	10,300	10,300	11,688	12,400	11,213	10,194	10,815	11,398	11,310	11,059	10,851	10,739
1954	10,300	10,300	10,300	10,300	10,371	10,300	11,168	11,448	11,335	11,072	10,859	10,744
1955	10,300	10,300	10,300	10,300	9,739	10,250	10,768	11,050	10,913	10,648	10,435	10,320
1956	10,249	10,237	12,400	12,400	12,400	12,250	12,400	12,400	12,334	12,115	11,700	11,000
1957	10,300	10,300	10,300	10,300	11,058	10,228	10,740	11,455	11,322	11,056	10,841	10,725
1958	10,300	10,300	10,300	10,300	12,400	12,400	12,400	12,400	12,069	11,868	11,642	11,000
1959	10,300	10,300	10,300	10,300	12,304	10,147	10,446	10,556	10,417	10,154	9,944	9,832
1960	9,768	9,746	9,782	10,209	10,300	10,291	10,441	10,508	10,336	10,193	10,056	9,941
1961	9,878	9,952	10,059	10,300	10,257	10,300	10,392	10,408	10,325	10,183	10,048	9,935
1962	9,864	9,841	9,932	10,051	12,400	12,153	12,400	12,400	12,366	12,095	11,700	11,000
1963	10,300	10,300	10,300	12,400	12,400	12,305	12,400	12,400	11,589	11,369	11,176	11,000
1964	10,300	10,300	10,300	10,300	9,525	9,868	10,164	10,301	10,154	9,892	9,685	9,575
1965	9,509	9,614	12,400	12,400	11,921	10,300	12,372	12,400	12,324	12,089	11,700	11,000
1966	10,300	10,300	10,300	10,278	10,179	10,300	10,370	10,423	10,284	10,022	9,814	9,703
1967	9,638	9,722	10,300	12,400	12,400	12,400	12,400	12,400	11,585	11,361	11,166	11,000
1968	10,300	10,300	10,300	10,691	10,169	10,114	10,735	11,015	10,889	10,626	10,413	10,299
1969	10,232	10,270	10,300	12,400	12,400	12,400	12,400	12,400	12,338	12,106	11,700	11,000
1970	10,300	10,300	10,300	12,400	11,524	12,400	12,400	12,400	12,285	12,020	11,681	11,000
1971	10,300	10,300	12,400	12,330	10,281	10,140	10,854	11,099	11,019	10,766	10,555	10,441
1972	10,300	10,299	10,300	10,300	10,300	10,266	10,342	10,305	10,125	9,854	9,637	9,523
1973	9,460	10,300	10,300	12,400	12,400	12,400	12,400	12,400	12,322	12,085	11,700	11,000
1974	10,300	10,167	12,400	12,400	10,736	12,400	12,400	12,400	12,076	11,899	11,650	11,000
1975	10,300	10,300	10,300	10,300	12,400	12,400	12,400	12,400	12,065	11,878	11,650	11,000
1976	10,300	10,300	10,300	10,300	10,300	10,298	10,354	10,304	10,106	9,960	9,823	9,713
1977	9,663	9,656	9,678	9,862	9,922	10,059	10,083	10,045	9,942	9,797	9,657	9,543
1978	9,469	9,445	9,925	12,400	12,400	12,400	12,400	12,400	11,595	11,369	11,170	11,000
1979	10,300	10,300	10,300	10,300	12,329	12,108	12,400	12,400	12,255	11,988	11,669	11,000
1980	10,300	10,300	10,300	12,400	12,400	12,400	12,400	12,400	12,327	12,105	11,700	11,000
1981	10,300	10,296	10,300	11,041	9,915	10,724	11,338	11,478	11,335	11,058	10,837	10,716
1982	10,300	10,300	10,300	12,400	12,400	12,400	12,400	12,400	11,878	11,670	11,481	11,000
1983	10,300	10,300	10,961	12,400	12,400	12,400	12,400	12,400	11,173	11,023	10,865	10,783
1984	10,300	10,300	12,400	10,891	10,244	10,300	10,943	11,446	11,370	11,119	10,912	10,800
1985	10,300	10,300	10,300	10,300	10,300	10,300	10,466	10,602	10,481	10,222	10,017	9,907
1986	9,839	9,855	10,032	10,201	12,400	12,400	12,400	12,393	12,048	11,821	11,623	11,000
1987	10,300	10,285	10,300	10,300	10,300	10,300	10,403	10,354	10,170	10,025	9,887	9,773
1988	9,703	9,690	10,053	10,300	10,235	10,300	10,381	10,345	10,250	10,104	9,966	9,851
1989	9,782	9,747	9,889	10,052	10,189	10,300	10,395	10,337	10,242	10,096	9,958	9,843
1990	9,773	9,864	9,972	10,300	10,300	10,300	10,371	10,371	10,280	10,135	9,996	9,881
1991	9,813	9,781	9,849	9,913	9,965	10,740	11,184	11,249	11,185	11,041	10,900	10,781
1992	10,294	10,270	10,300	10,300	12,400	11,221	11,798	11,907	11,877	11,735	11,592	10,910
1993	10,178	10,155	10,300	12,400	12,400	12,400	12,400	12,400	11,760	11,520	11,316	11,000
1994	10,300	10,300	10,300	10,300	10,324	10,300	10,573	10,768	10,605	10,462	10,324	10,208
1995	10,132	10,162	10,300	12,400	11,562	12,400	12,400	12,400	11,694	11,639	11,494	11,000
1996	10,300	10,300	10,300	12,400	12,400	12,400	12,400	12,400	12,071	11,878	11,644	11,000
1997	10,300	10,300	12,400	12,400	11,759	10,300	10,666	10,795	10,695	10,469	10,281	10,194
1998	10,159	10,300	10,300	12,400	12,400	12,400	12,400	12,400	11,954	12,031	11,700	11,000
1999	10,300	10,300	10,300	10,300	12,400	11,894	12,400	12,400	12,380	12,205	11,700	11,000
2000	10,300	10,300	10,300	10,300	12,400	12,400	12,400	12,400	12,313	12,091	11,700	11,000
2001	10,300	10,300	10,300	10,300	11,596	11,651	12,288	12,400	12,237	11,964	11,661	11,000
2002	10,300	10,300	10,300	10,265	9,874	10,168	10,586	10,712	10,582	10,317	10,102	9,985
Avg (21-02)	10,150	10,161	10,516	11,026	11,350	11,207	11,548	11,635	11,407	11,187	10,952	10,594
Max (21-02)	10,300	10,300	12,400	12,400	12,400	12,400	12,400	12,400	12,380			

**D2. 2018 WSIP Model Run with Crystal Springs Restricted and
Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases**

Table 2-27 Calaveras Reservoir Storage (MG) - Revised WSIP 2018 Setting

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	28,500	27,000	28,415	31,078	31,500	31,500	31,500	31,444	31,153	30,764	30,375	30,000
1922	28,500	27,000	27,000	28,295	31,500	31,500	31,500	31,500	31,207	30,836	30,457	30,000
1923	28,500	27,000	30,014	30,416	30,457	30,653	31,500	31,441	31,171	30,781	30,393	30,000
1924	28,500	27,000	26,859	26,549	26,030	25,608	25,358	25,047	24,701	24,308	23,930	23,596
1925	23,331	21,400	20,238	20,455	24,832	24,764	25,259	25,696	25,415	25,039	24,671	24,345
1926	24,086	23,938	23,395	23,619	30,000	30,301	31,500	31,356	31,078	30,683	30,293	29,946
1927	28,500	27,619	27,000	28,500	31,500	31,484	31,500	31,500	31,256	30,873	30,488	30,000
1928	28,500	27,000	26,901	27,336	28,170	31,500	31,500	31,498	31,138	30,749	30,361	30,000
1929	28,500	27,000	27,000	27,649	28,104	29,088	29,407	29,244	28,955	28,556	28,168	27,825
1930	27,555	25,277	23,552	24,551	25,432	29,430	29,604	29,485	29,171	28,777	28,391	28,049
1931	27,790	27,000	26,564	26,806	26,636	26,500	26,337	26,095	25,781	25,396	25,024	24,695
1932	24,429	24,281	26,996	28,500	30,000	30,103	30,212	30,069	29,809	29,417	29,030	28,688
1933	28,430	27,000	26,484	27,426	27,446	27,647	27,814	27,781	27,480	27,090	26,711	26,376
1934	26,109	25,959	27,000	28,500	29,840	30,078	30,012	29,782	29,488	29,088	28,699	28,355
1935	28,087	25,511	23,959	28,500	28,537	29,914	31,500	31,500	31,107	30,718	30,330	29,985
1936	28,500	27,000	26,568	27,457	31,500	31,500	31,500	31,500	31,232	30,843	30,454	30,000
1937	28,500	27,000	26,983	27,210	30,461	31,500	31,500	31,500	31,147	30,771	30,389	30,000
1938	28,500	27,000	27,000	28,482	31,500	31,500	31,500	31,500	31,217	30,873	30,506	30,000
1939	28,500	27,000	27,000	27,234	27,910	28,520	28,588	28,406	28,129	27,741	27,362	27,026
1940	26,757	24,761	23,034	27,618	31,500	31,500	31,500	31,500	31,222	30,860	30,485	30,000
1941	28,500	27,000	27,000	29,412	31,500	31,500	31,500	31,498	30,621	30,296	29,939	29,613
1942	28,500	27,000	27,116	30,874	31,500	31,500	31,500	31,500	30,743	30,391	30,021	29,687
1943	28,500	27,000	26,737	31,088	31,500	31,500	31,500	31,500	31,205	30,834	30,453	30,000
1944	28,500	27,000	27,000	27,095	29,906	31,500	31,500	31,500	31,235	30,836	30,443	30,000
1945	28,500	25,755	24,330	24,879	30,000	31,500	31,500	31,500	31,211	30,823	30,435	30,000
1946	28,500	27,000	30,599	30,931	30,000	30,578	31,136	31,323	31,089	30,701	30,314	29,969
1947	28,500	27,000	27,000	27,194	27,576	28,417	29,005	29,009	28,750	28,363	27,985	27,650
1948	27,389	27,000	26,637	26,501	26,337	26,807	28,034	28,391	28,111	27,723	27,344	27,010
1949	26,745	26,600	26,696	26,644	26,853	31,500	31,500	31,500	31,187	30,796	30,408	30,000
1950	28,500	25,650	23,948	26,264	28,675	28,943	29,236	29,191	28,909	28,515	28,130	27,789
1951	27,522	27,375	30,479	31,240	31,500	31,471	31,500	31,500	31,221	30,855	30,480	30,000
1952	28,500	27,000	27,785	31,500	31,500	31,500	31,500	31,500	31,266	30,923	30,557	30,000
1953	28,500	27,000	28,372	31,500	30,000	31,427	31,500	31,500	31,125	30,740	30,354	30,000
1954	28,500	27,000	27,000	28,216	30,000	31,500	31,500	31,500	31,245	30,848	30,456	30,000
1955	28,500	25,702	25,406	27,607	27,955	28,351	28,680	28,766	28,497	28,108	27,727	27,389
1956	27,120	26,982	31,500	31,500	31,500	31,500	31,500	31,500	31,305	30,960	30,593	30,000
1957	28,500	27,000	26,998	27,123	29,985	30,476	30,816	31,348	31,074	30,673	30,280	29,932
1958	28,500	27,000	26,674	28,500	31,500	31,500	31,500	31,500	30,899	30,574	30,217	29,891
1959	28,500	27,000	27,000	28,311	30,110	30,396	30,514	30,410	30,129	29,730	29,339	28,993
1960	28,500	25,649	23,937	24,089	26,031	25,906	25,879	25,747	25,452	25,070	24,699	24,371
1961	24,116	24,071	23,748	23,758	23,599	23,928	23,845	23,666	23,375	23,005	22,648	22,302
1962	22,046	21,903	21,885	21,722	27,505	29,784	30,072	30,173	29,919	29,528	29,141	28,798
1963	28,500	27,000	26,589	29,556	31,500	31,500	31,500	31,500	30,424	30,078	29,713	29,383
1964	28,500	27,000	27,000	28,460	28,051	28,116	28,234	28,165	27,882	27,493	27,113	26,777
1965	26,510	24,648	27,797	31,500	30,713	31,042	31,500	31,500	31,180	30,820	30,445	30,000
1966	28,500	27,000	27,000	28,192	29,658	29,984	29,864	29,703	29,424	29,028	28,640	28,297
1967	28,028	27,000	27,000	30,676	31,025	31,500	31,500	31,500	30,296	29,946	29,580	29,248
1968	28,500	27,000	26,684	28,500	29,520	30,550	31,005	31,081	30,812	30,412	30,020	29,673
1969	28,500	27,000	27,000	31,500	31,500	31,500	31,500	31,500	31,373	31,015	30,637	30,000
1970	28,500	25,701	24,368	28,576	29,768	31,500	31,500	31,466	31,216	30,824	30,440	30,000
1971	28,500	27,000	29,494	29,235	28,870	29,872	30,425	30,467	30,249	29,866	29,478	29,135
1972	28,500	27,000	27,000	27,204	27,662	27,451	27,343	27,096	26,783	26,391	26,007	25,670
1973	25,409	27,000	26,900	31,500	31,500	31,500	31,500	31,500	31,264	30,901	30,526	30,000
1974	28,500	27,000	29,474	30,817	30,000	31,490	31,500	31,500	31,282	30,980	30,615	30,000
1975	28,500	25,737	24,367	24,880	31,242	31,500	31,500	31,500	31,248	30,934	30,593	30,000
1976	28,500	27,000	26,611	26,416	26,140	26,039	25,913	25,658	25,334	24,947	24,575	24,250
1977	24,007	23,877	23,785	23,687	23,373	23,144	22,988	22,755	22,445	22,074	21,713	21,396
1978	21,138	20,995	21,140	28,500	30,870	31,500	31,500	31,500	31,282	30,924	30,549	30,000
1979	28,500	27,000	26,965	28,492	30,330	31,500	31,500	31,483	31,201	30,808	30,416	30,000
1980	28,500	25,751	25,164	29,569	31,500	31,500	31,500	31,500	31,304	30,957	30,587	30,000
1981	28,500	27,000	26,628	28,500	28,366	31,500	31,500	31,430	31,146	30,735	30,335	29,983
1982	28,500	27,000	27,000	31,500	31,500	31,500	31,500	31,500	30,792	30,459	30,098	29,770
1983	28,500	27,000	27,645	31,500	31,500	31,500	31,500	31,500	30,457	30,181	29,850	29,540
1984	28,500	27,181	30,390	28,632	28,748	29,169	29,649	29,964	29,754	29,377	28,999	28,662
1985	28,411	26,594	25,399	25,421	26,185	27,447	27,433	27,367	27,117	26,739	26,368	26,037
1986	25,772	25,665	25,356	25,243	31,500	31,500	31,500	31,500	31,241	30,887	30,516	30,000
1987	28,500	27,000	26,969	26,851	26,859	26,975	26,895	26,639	26,324	25,934	25,557	25,224
1988	24,959	24,822	24,758	25,212	24,980	24,686	24,589	24,353	24,046	23,668	23,303	22,980
1989	22,722	22,578	22,612	22,493	22,239	22,468	22,392	22,142	21,846	21,481	21,128	20,763
1990	20,512	18,882	17,431	17,562	17,676	17,564	17,475	17,306	17,038	16,704	16,378	16,026
1991	15,794	15,666	15,622	15,408	15,094	18,458	18,761	18,659	18,419	18,085	17,757	17,405
1992	17,168	17,034	17,114	17,124	23,078	24,395	24,821	24,745	24,514	24,150	23,790	23,431
1993	23,179	23,035	23,591	29,422	31,500	31,500	31,500	31,500	31,230	30,860	30,481	30,000
1994	28,500	27,000	27,000	26,969	29,228	29,295	29,388	29,379	29,078	28,679	28,292	27,950
1995	27,673	25,390	23,973	31,500	30,346	31,500	31,500	31,500	31,122	30,944	30,627	30,000
1996	28,500	27,000	26,797	30,568	31,500	31,500	31,500	31,500	31,291	30,971	30,609	30,000
1997	28,500	27,626	31,500	31,500	30,544	30,943	31,131	31,047	30,805	30,444	30,075	29,756
1998	28,500	27,000	26,865	31,295	31,500	31,500	31,500	31,500	31,057	31,020	30,795	30,000
1999	28,500	27,000	27,000	28,500	31,500	31,500	31,500	31,500	31,290	30,991	30,662	30,000
2000	28,500	25,723	23,996	25,459	30,604	31,500	31,500	31,500	31,291	30,943	30,565	30,000
2001	28,500	27,000	26,495	26,823	29,992	31,500	31,500	31,407	31,108	30,708	30,315	29,967
2002	28,500	27,000	27,000	28,260	28,556	30,077	30,321	30,236	29,965	29,566	29,173	28,824
Avg (21-02)	27,235	25,907	26,040	27,624	28,952	29,576	29,707	29,676	29,346	28,980	28,607	28,200
Max (21-0												

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Appendix D.3

TECHNICAL MEMORANDUM: ESTIMATION OF FLOW CHANGES IN LOWER ALAMEDA CREEK WITH IMPLEMENTATION OF THE CDRP AND WSIP

D.3 TECHNICAL MEMORANDUM – ESTIMATION OF FLOW CHANGES IN LOWER ALAMEDA CREEK WITH IMPLEMENTATION OF THE CDRP AND WSIP

D.3.1 INTRODUCTION

To determine the effects of the CDRP (including implementation of all WSIP projects)¹, flow changes in lower Alameda Creek at the Niles Gage were estimated using the following methodology:

1. Flow records from three U.S. Geological Survey (USGS) gages were reviewed on an average monthly flow basis in the Alameda Creek watershed for periods of overlapping record (water years [WY] 2000-2007). Eight years of records were available. The gages are on upper Alameda Creek (Alameda C BL Welch C), Arroyo de la Laguna (Arroyo de la Laguna A Verona), and lower Alameda Creek (Alameda C Near Niles).
2. Monthly relationships were developed among the three gages to determine flow proportions at the Niles Gage from each of the two major upstream watersheds, named, for this analysis, Arroyo de la Laguna (ADLL) and upper Alameda Creek to reflect the major tributaries draining each watershed.
3. Using gage records from Arroyo Hondo (unimpaired inflow to Calaveras) the years of available gage records were classified by into one of five hydrologic year types. The year types were based on a ranking system developed for analysis of Hetch-Hetchy Local Simulation Model (HH/LSM) model data. The analysis of HH/LSM data used aggregated annual inflow to local reservoirs to rank years for the 82-year period (from 1921 to 2002) into 20th percentiles. The five hydrologic year type groups were labeled Wet, Above Normal, Normal, Below Normal, and Dry.
4. Flow in Alameda Creek at Niles with implementation of the CDRP (and WSIP) was estimated using the eight years of gage record, adjusted based on the flow changes estimated by the HH/LSM for Alameda Creek above ADLL. The analysis was performed based on hydrologic year types and used the 2018 WSIP Variant model run, modified to include 1997 California Department of Fish and Game Memorandum of Understanding (1997 MOU) releases from ACDD. Charts and tables demonstrating the expected changes in flow for each of the eight years were developed to illustrate the potential effects of the

¹ Note that while this analysis has been used as part of the impact assessment for the CDRP project, all WSIP projects are included in the modeling relied upon for the calculations detailed in this document. The Upper Alameda Creek Filter Gallery Project is one of the WSIP projects, would be located in the vicinity of the San Antonio Creek confluence, and would recover up to 20 cfs of flow from Alameda Creek released at ACDD or Calaveras Dam in fulfillment of the 1997 MOU Agreements.

CDRP (and WSIP) on flow in lower Alameda Creek for the period of available gage record.

D.3.2 ANALYSIS

D.3.2.1 GAGE RECORD ANALYSIS

Flow records from three USGS gages were reviewed on an average monthly flow basis in the Alameda Creek watershed for periods of overlapping record (WY 2000–2007). The three gages were chosen to represent flow in the two major upstream basins of the Alameda Creek watershed (upper Alameda Creek and Arroyo de la Laguna) and flow in the lower reach of Alameda Creek. Upper Alameda Creek flow is recorded by the USGS “Alameda C BL Welch C” gage (AC Welch Gage), located in the Sunol Valley reach of Alameda Creek below the confluence at Welch Creek, near the Sunol Valley Water Treatment Plant. Arroyo de la Laguna flow is monitored by the USGS “Arroyo de la Laguna A Verona” gage (ADLL Gage) on ADLL approximately three miles upstream of the ADLL and Alameda Creek confluence. The USGS “Alameda C Near Niles” gage (AC Niles Gage) records a combination of these two flows, as well as the contribution or loss of flow from the watershed between these gages and the Niles Gage, including flow from San Antonio Creek and State Water Project releases. **Figure D.3-1** shows the location of the three gages and the watersheds associated with each gage.

Figure D.3-2 presents the mean monthly flow over the eight-year period for the three gages. The flow data at the AC Niles Gage (shown as a black line) show that the ADLL Gage (shown in blue-shaded area) generally provides a higher percentage of the flow compared to the AC Welch Gage (shown in green-shaded area). Discrepancies between the summation of the ADLL and AC Welch flows and the flow at the Niles Gage (the white space below the black line) are assumed to be other inflow from the watershed between the two upper gages and the Niles Gage, labeled Niles-SA watershed on Figure D.3-1. The Niles-SA watershed includes releases made from San Antonio Reservoir and the State Water Project, which occur downstream of the two upper gages.

Releases or spills from San Antonio Reservoir rarely occur. The flow in San Antonio Creek usually results from groundwater seepage or runoff from the watershed downstream of Turner Dam. The Niles-SA watershed contribution noted during the summer months is assumed to be primarily from releases from the State Water Project and contribution from groundwater in Niles Canyon. Also notable in the chart are the spikes in flow from upper Alameda Creek in the winter and spring of WY 2005 and 2006. These spikes are the result of above-normal runoff in the watershed as well as restricted storage at Calaveras Reservoir.

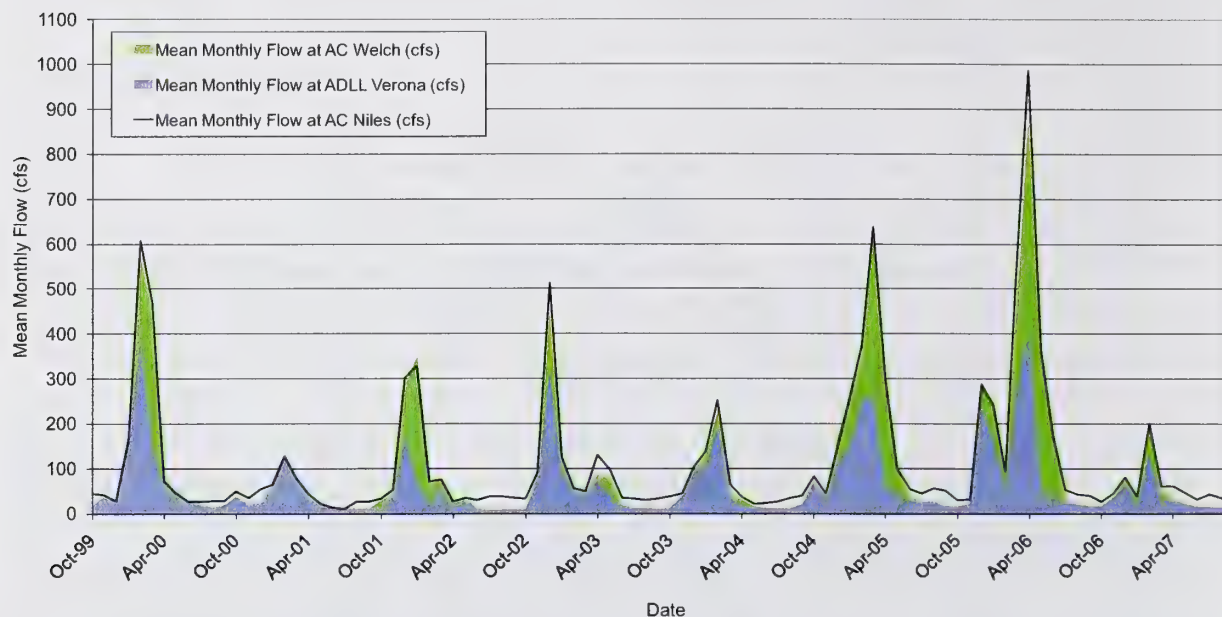


SOURCE: ESA+Orion; USGS, 1969.

Calaveras Dam Replacement Project ■ 2005.0161E

Figure D.3-1

Location of USGS Gages and Contributing Watersheds Defined for Lower Alameda Creek Analysis



SOURCE: USGS Gage Data.

Calaveras Dam Replacement Project ■ 2005.0161E

Figure D.3-2
Flow Contribution from ADLL and AC Welch Gages
at the AC Niles Gage, WY 2000–2007

D.3.2.2 MONTHLY RELATIONSHIPS

Table D.3-1 shows a month-by-month review of the percent contribution from each of the watersheds contributing to flow in Alameda Creek, as measured at the Niles Gage.

Table D.3-1: Percent Flow Contribution at the AC Niles Gage

ADLL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY Total
2000	40%	96%	91%	95%	65%	32%	74%	83%	87%	75%	45%	67%	60%
2001	76%	62%	40%	92%	98%	88%	76%	74%	104%	119%	42%	41%	78%
2002	38%	79%	58%	21%	39%	61%	59%	82%	34%	21%	25%	30%	43%
2003	29%	89%	64%	75%	89%	90%	58%	43%	41%	37%	42%	32%	63%
2004	33%	86%	91%	78%	81%	55%	48%	68%	56%	43%	35%	54%	71%
2005	88%	73%	81%	58%	68%	40%	20%	41%	56%	55%	48%	35%	51%
2006	54%	72%	85%	68%	65%	52%	42%	12%	21%	46%	49%	44%	47%
2007	62%	79%	82%	61%	68%	50%	46%	44%	50%	36%	43%	46%	60%

AC Welch	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY Total
2000	1%	2%	6%	10%	30%	61%	18%	17%	13%	6%	2%	2%	33%
2001	2%	3%	2%	5%	6%	10%	8%	8%	7%	4%	1%	1%	5%
2002	52%	2%	37%	86%	52%	36%	29%	13%	6%	2%	0%	0%	46%
2003	0%	6%	23%	21%	9%	5%	8%	35%	14%	3%	1%	0%	17%
2004	1%	1%	2%	17%	10%	8%	39%	6%	1%	1%	0%	0%	9%
2005	0%	1%	36%	40%	25%	55%	76%	54%	12%	6%	1%	1%	42%
2006	1%	2%	18%	35%	29%	32%	47%	90%	77%	4%	2%	1%	44%
2007	2%	4%	12%	14%	28%	27%	7%	4%	3%	1%	0%	0%	14%

Niles-SA Wshed	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY Total
2000	59%	2%	4%	-5%	5%	7%	8%	0%	0%	19%	53%	30%	8%
2001	22%	35%	57%	3%	-3%	1%	16%	18%	-11%	-23%	57%	59%	17%
2002	10%	20%	5%	-7%	8%	3%	12%	6%	60%	77%	75%	70%	11%
2003	71%	5%	13%	5%	2%	4%	33%	22%	45%	60%	58%	68%	20%
2004	67%	13%	8%	5%	9%	37%	12%	26%	43%	57%	65%	46%	20%
2005	12%	25%	-17%	2%	6%	4%	4%	5%	32%	39%	51%	65%	8%
2006	45%	26%	-2%	-2%	6%	16%	11%	-2%	2%	49%	49%	55%	10%
2007	36%	17%	6%	25%	4%	23%	47%	51%	47%	64%	57%	54%	27%

Niles-SA watershed values were calculated by subtracting ADLL and AC Welch flow rates from the flow gaged at Niles. Negative values for the Niles-SA watershed are assumed to be the result of loss to groundwater (particularly in the Sunol reach downstream of the Welch Gage), discrepancy introduced when daily flows are converted to monthly average flows, or gage error.

Table D.3-2 summarizes of the month-by-month analysis for WY 2000–2007.

Table D.3-2: Mean Monthly Percentages of Watershed Contributions at the AC Niles Gage, WY 2000–2007

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY Total
ADLL	58%	81%	71%	61%	70%	46%	42%	34%	40%	47%	41%	43%	55%
AC Welch	6%	3%	23%	40%	24%	44%	45%	59%	39%	3%	1%	1%	33%
Niles-SA	36%	16%	6%	-1%	5%	10%	13%	7%	20%	50%	58%	57%	13%

Table D.3-3 shows the relative contribution of the upstream watersheds to flow at the Niles Gage over the past eight hydrologic years from WY 2000 to 2007. Operation of the CDRP as well as other WSIP projects would alter flow in the upper Alameda Creek watershed, which accounted for approximately 33% of flow at Niles over the period of available data. Therefore, implementation of the CDRP and WSIP would affect approximately one-third of the flow that contributes to flow at the Niles Gage.

Table D.3-3: Summary of Flow Contributions at the AC Niles Gage, WY 2000–2007

Watershed	Eight-Year Average Contribution	Eight-Year Range of Contribution
Arroyo de la Laguna	55%	43% – 71%
Upper Alameda Creek	33%	5% – 46%
Niles–San Antonio Creek	13%	8% – 27%

D.3.2.3 CLASSIFICATION OF YEAR TYPES

The hydrologic ranking system for the Alameda watershed that was used for the HH/LSM analysis (5 Reservoir Index) was developed using WY 1921 to 2002 data. Years were ranked into 20th percentiles and labeled Wet, Above Normal, Normal, Below Normal, and Dry based on inflow to local reservoirs. This ranking system includes WY 2000, 2001, and 2002. WY 2003 to 2007 were ranked according to the same index using unimpaired runoff at Arroyo Hondo. Table D.3-4 summarizes the year types over the period analyzed.

Table D.3-4: Year Types for WY 2000–2007

2000	Above Normal
2001	Below Normal
2002	Below Normal
2003	Normal
2004	Normal
2005	Above Normal
2006	Above Normal
2007	Dry

As shown in Table D.3-4, the past eight years provide a reasonable cross-section of hydrologic year types, because only wet years are absent.

Table D.3-5 presents a series of tables that summarize the monthly flow reductions predicted by the HH/LSM for Alameda Creek below the San Antonio Creek confluence with implementation of the project. The first of these tables shows the existing condition (Calaveras Down) compared with implementation of the CDRP and WSIP projects. The second table compares the Calaveras Up scenario (i.e., the pre-DSOD restricted condition at Calaveras Reservoir) with implementation

of the CDRP and WSIP projects. Note that the biggest impacts on flow in Alameda Creek with the project would occur in Normal and Above Normal months, which are both represented in this analysis.

Table D.3-5: HH/LSM flow reductions in Alameda Creek below the San Antonio Confluence

Percent Change, Base (VBA BASERH) vs 2018 CDRP Proposed Program (WSIP 2018 CSRE ACDD RH DT2300)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
All	0%	0%	-17%	-28%	-18%	-6%	2%	10%	0%	0%	0%	0%
Wet	0%	0%	-13%	-21%	-8%	-1%	-2%	23%	0%	0%	0%	0%
Above Normal	0%	0%	-19%	-43%	-31%	-11%	24%	-9%	0%	0%	0%	0%
Normal	0%	0%	-23%	-42%	-55%	-41%	10%	5%	0%	0%	0%	0%
Below Normal	0%	0%	0%	0%	-6%	2%	20%	0%	0%	0%	0%	0%
Dry	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Percent Change, Base (Calaveras Up) vs WSIP Proposed Program (Not Revised)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
All	0%	0%	32%	19%	22%	2%	-3%	12%	0%	0%	0%	0%
Wet	0%	0%	49%	14%	13%	-3%	-7%	8%	0%	0%	0%	0%
Above Normal	0%	0%	26%	38%	67%	15%	18%	38%	0%	0%	0%	0%
Normal	0%	0%	5%	14%	17%	18%	16%	0%	0%	0%	0%	0%
Below Normal	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dry	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	Increase of greater than 1%
	Decrease of greater than 1%
	Decrease of greater than 5%

The Base condition with Calaveras Up was included in the analysis because the DSOD restriction on Calaveras Reservoir was implemented in late 2001. Review of Calaveras Reservoir water surface elevations reveals that the restricted operations were fully implemented in WY 2002. Therefore, this analysis uses the Base, Calaveras Up condition for WY 2000–2001 and the Base, Calaveras Down condition for the remainder of the years.

Updated modeling performed for the CDRP EIR, dated May 5, 2009, was used for the WY 2002–2007 comparison. Model runs performed in July 2006 as part of the Programmatic EIR were used for the Base (Calaveras Up) and the “with project” condition for WY 2000–2001. Model runs for the Base (Calaveras Up) scenario were not revised after 2006; therefore, the earlier model runs were used for the Calaveras Up condition in the first two years of the analysis.

The implementation of the CDRP and WSIP projects assumes that flows detailed in the 1997 MOU will first be met by flow bypassed at ACDD and then by releases from Calaveras Dam. The model also includes recapture of the MOU flows in Alameda Creek upstream of the confluence with San Antonio Creek. Therefore, the flow in Alameda Creek below San Antonio Creek calculated for the “with project” condition does not include these MOU flows; the model assumes they have been recaptured and conveyed to the regional water system. The model does not account for groundwater loss in the Sunol Valley. Therefore, both the base case and the

future scenario with implementation of the WSIP assume no change in groundwater gains or losses.

This assumption is conservative for two reasons. First, the future condition will likely include the cumulative project to install slurry walls adjacent to the quarries in the Sunol Valley (the SMP-30 Cemex Quarry Expansion project), reducing the loss to groundwater and increasing the amount of flow that reaches lower Alameda Creek from the Sunol Valley. Second, this analysis likely overestimates the contribution of upper Alameda Creek to flow at the AC Niles Gage, because no loss to groundwater is assumed in the Sunol reach of Alameda Creek below the AC Welch Gage. If groundwater losses were included in the model, the upper Alameda Creek watershed contribution would be reduced and the Niles-SA watershed contribution would be increased.

D.3.2.4 ANALYSIS OF THE EIGHT WATER YEARS OF RECORD

The percent reductions in monthly flow estimated using the HH/LSM and presented above were applied to monthly gage flow at AC Welch. The resulting changes in flow at AC Welch and AC Niles are presented in the following charts and tables. Attachment D.3.1 presents a year-by-year summary of monthly flow changes at AC Welch and AC Niles that would occur with implementation of the CDRP and WSIP projects.

The AC Welch Gage and the HH/LSM analysis location of Alameda Creek below the San Antonio confluence are not the same. The San Antonio Creek confluence is approximately 2.7 miles downstream of the AC Welch Gage. This analysis applied the percent change in flow from the HH/LSM analysis, not actual flow numbers, to the Welch Gage. This difference in location was not considered significant for this level of analysis, and the percent reduction in flow was considered applicable for flow in Alameda Creek in the vicinity of the Welch Gage.

Table D.3-6 presents the results of applying the HH/LSM flow reductions to the gage record for AC Welch for WY 2000–2007. The second table represents the future condition with implementation of the CDRP and WSIP projects.

Table D.3-6: Comparison of Recorded and Calculated Flow in Alameda Creek at the AC Welch Gage

Recorded Flow in Alameda Creek at Welch Gage (cfs, avg. monthly)													
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YT
2000	0	1	2	17	183	287	13	8	3	2	1	1	AN
2001	1	1	1	3	7	8	3	2	1	0	0	0	BN
2002	17	1	112	282	37	28	8	4	2	1	0	0	BN
2003	0	5	117	26	5	3	11	34	5	1	0	0	N
2004	0	0	2	24	26	5	14	1	0	0	0	0	N
2005	0	1	53	106	95	351	227	53	7	3	1	0	AN
2006	0	1	51	84	27	177	466	325	133	2	1	0	AN
2007	1	2	10	5	56	16	4	2	1	0	0	0	D

Calculated Flow at Welch for Future Condition with Project, 2018 (cfs, avg. monthly)													
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YT
2000	0	1	2	23	305	331	16	10	3	2	1	1	AN
2001	1	1	1	3	7	8	3	2	1	0	0	0	BN
2002	17	1	112	282	35	28	9	4	2	1	0	0	BN
2003	0	5	90	15	2	2	12	36	5	1	0	0	N
2004	0	0	1	14	12	3	16	1	0	0	0	0	N
2005	0	1	43	60	66	313	282	48	7	3	1	0	AN
2006	0	1	41	47	19	158	578	295	133	2	1	0	AN
2007	1	2	10	5	56	16	4	2	1	0	0	0	D

Difference Between Recorded and Calculated Flow for Future Condition with Project at Welch (cfs, avg. monthly)																									
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YT												
2000	0	[0%]	0	[26%]	6	[38%]	122	[67%]	44	[15%]	2	[18%]	3	[38%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	AN
2001	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	BN
2002	0	[0%]	0	[0%]	0	[0%]	-2	[-6%]	1	[2%]	2	[20%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	BN
2003	0	[0%]	0	[-27]	[-23%]	-11	[-42%]	-3	[-55%]	-1	[-41%]	1	[10%]	2	[5%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	N
2004	0	[0%]	0	[0%]	0	[-23%]	-10	[-42%]	-14	[-55%]	-2	[-41%]	1	[10%]	0	[5%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	N
2005	0	[0%]	0	[0%]	-10	[-19%]	-46	[-43%]	-29	[-31%]	-38	[-11%]	55	[24%]	-5	[-9%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	AN
2006	0	[0%]	0	[0%]	-10	[-19%]	-36	[-43%]	-8	[-31%]	-19	[-11%]	112	[24%]	-29	[-9%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	AN
2007	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	D

Increase of greater than 1%

Decrease of greater than 1%

Decrease of greater than 5%

Figure D.3-3 and Table D.3-7 show the predicted changes in flow that would occur in Alameda Creek at AC Niles over the eight-year period (WY 2000–2007) with implementation of the CDRP and WSIP. On the chart, the solid blue area represents average monthly gage flow at AC Niles, and the black line represents calculated flow with the implementation of the CDRP and WSIP. The discrepancy between the two lines represents the change between gage records and calculated flow under the future condition with project.

The analysis shows that flow at the Niles Gage would be reduced with the CDRP and WSIP when compared to the current DSOD-restricted operating condition, based on the historical hydrology from 2001 to 2007. Reductions of up to 17% in average monthly flow could occur in years similar to the past eight years of record. The maximum flow reduction would occur during January of 2005, an Above Normal year. However, there would be a flow increase of 18% in April of that same year type. No changes in flow would occur in Dry and Below Normal years, with the exception of a slight decrease in February of Below Normal years. In 2000, an Above Normal year, there would be up to a 20% increase in flow with implementation of the CDRP and

WSIP, which represents a comparison with historical operating conditions prior to the DSOD operating restrictions.

Table D.3-7: Comparison of Average Monthly Flow at the AC Niles Gage Recorded Flow versus Calculated flow under the CDRP AND WSIP

Recorded Flow in Alameda Creek at Niles (cfs, avg. monthly)

Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year
2000	44	41	28	165	606	469	74	46	26	27	29	29	AN
2001	50	35	55	65	128	79	44	22	14	10	27	27	BN
2002	33	53	302	329	71	76	27	34	30	39	38	36	BN
2003	34	91	513	126	56	50	131	97	35	33	30	33	N
2004	39	45	104	138	251	65	36	21	23	27	35	41	N
2005	83	45	148	262	374	638	300	98	55	46	57	51	AN
2006	30	32	287	242	94	551	986	361	172	53	44	39	AN
2007	28	45	82	38	202	61	61	47	32	43	35	37	D

Calculated Flow at Niles for Future Condition with Project, 2018 (cfs, avg. monthly)

Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year
2000	44	41	28	171	728	513	76	49	26	27	29	29	AN
2001	50	35	55	65	128	79	44	22	14	10	27	27	BN
2002	33	53	302	329	68	77	28	34	30	39	38	36	BN
2003	34	91	486	115	53	49	132	99	35	33	30	33	N
2004	39	45	103	128	237	62	37	21	23	27	35	41	N
2005	83	45	138	216	345	599	355	94	55	46	57	51	AN
2006	30	32	277	205	86	532	1098	332	172	53	44	39	AN
2007	28	45	82	38	202	61	61	47	32	43	35	37	D

Difference Between Recorded and Calculated Flow with Project at Niles (cfs, avg. monthly)

Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Typ
2000	0 [0%]	0 [0%]	0 [1%]	6 [4%]	122 [20%]	44 [9%]	2 [3%]	3 [6%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2001	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	BN
2002	0 [0%]	0 [0%]	0 [0%]	0 [0%]	-2 [-3%]	1 [1%]	2 [6%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	BN
2003	0 [0%]	0 [0%]	-27 [-5%]	-11 [-9%]	-3 [-5%]	-1 [-2%]	1 [1%]	2 [2%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	N
2004	0 [0%]	0 [0%]	0 [0%]	-10 [-7%]	-14 [-6%]	-2 [-3%]	1 [4%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	N
2005	0 [0%]	0 [0%]	-10 [-7%]	-46 [-17%]	-29 [-8%]	-38 [-6%]	55 [18%]	-5 [-5%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2006	0 [0%]	0 [0%]	-10 [-3%]	-36 [-15%]	-8 [-9%]	-19 [-4%]	112 [11%]	-29 [-8%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2007	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	D

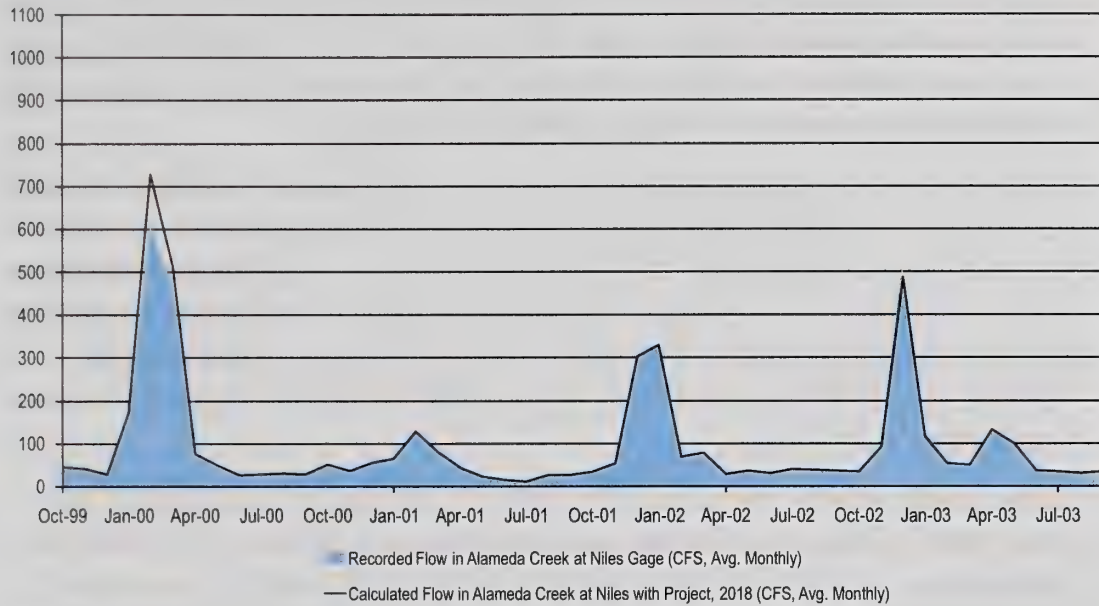
	Increase of greater than 1%
	Decrease of greater than 1%
	Decrease of greater than 5%

WY 2000–2007 include four of the five hydrologic year types; note that a Wet year is absent. However, as shown in Table D.3-5, the largest reductions in flow with implementation of the CDRP and WSIP would occur during Normal and Above Normal years, which are included in this analysis. Therefore, this analysis covers the flow reduction scenario with the greatest impacts expected under the future condition with project.

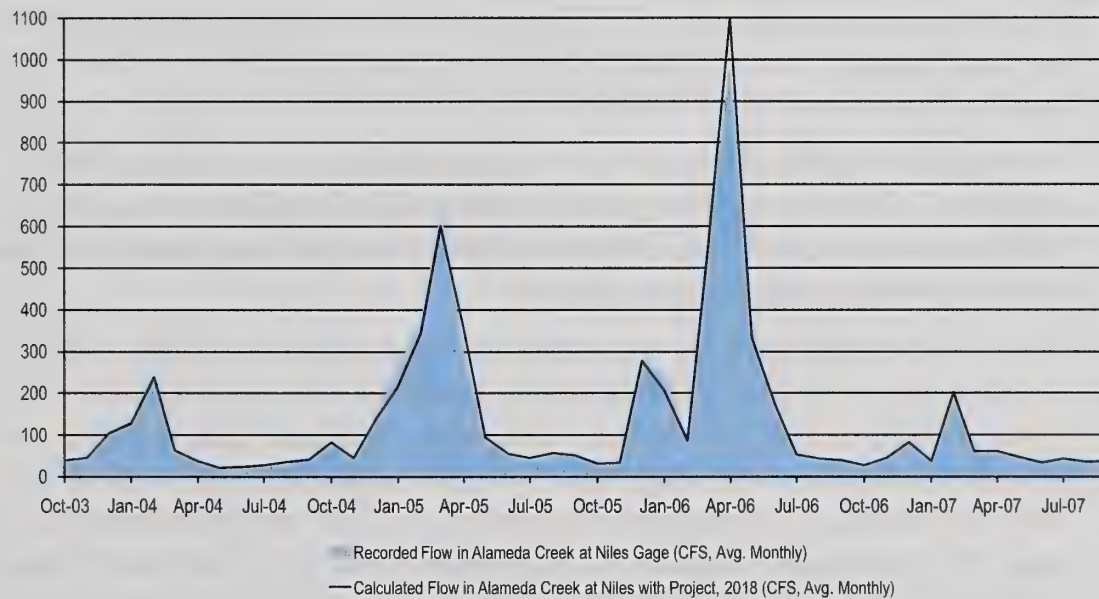
The largest decrease in flow in lower Alameda Creek in the analysis would occur in a month similar to January of 2005, with a reduction in average monthly flow of 46 cubic feet per second, or 17%, of the average monthly flow recorded in January 2005. This corresponds to a reduction in upper Alameda Creek of 43%. The data also show that flow reductions are calculated to occur in December through March of Normal to Wet years and in April of Wet years. In all other months, including winter months of Below Normal (with the exception of a slight decrease in

February) and Dry years, flow in upper Alameda Creek and at Niles would either remain the same or increase under the WSIP.

WY 2000-2003



WY 2000-2003



Notes:

- Future condition with implementation of CDRP includes recapture of MOU flows released from Calaveras Dam.
- Years 2000 and 2001 analysis includes a comparison of Base with Calaveras Up vs Future Condition with Project.
- DSOD restriction was implemented in 2001, with Calaveras Reservoir level reduction beginning in WY 2002.
- Analysis for CDRP and WSIP only, no other cumulative projects analyzed.

SOURCE: USGS gage data, SFPUC HHLSM data

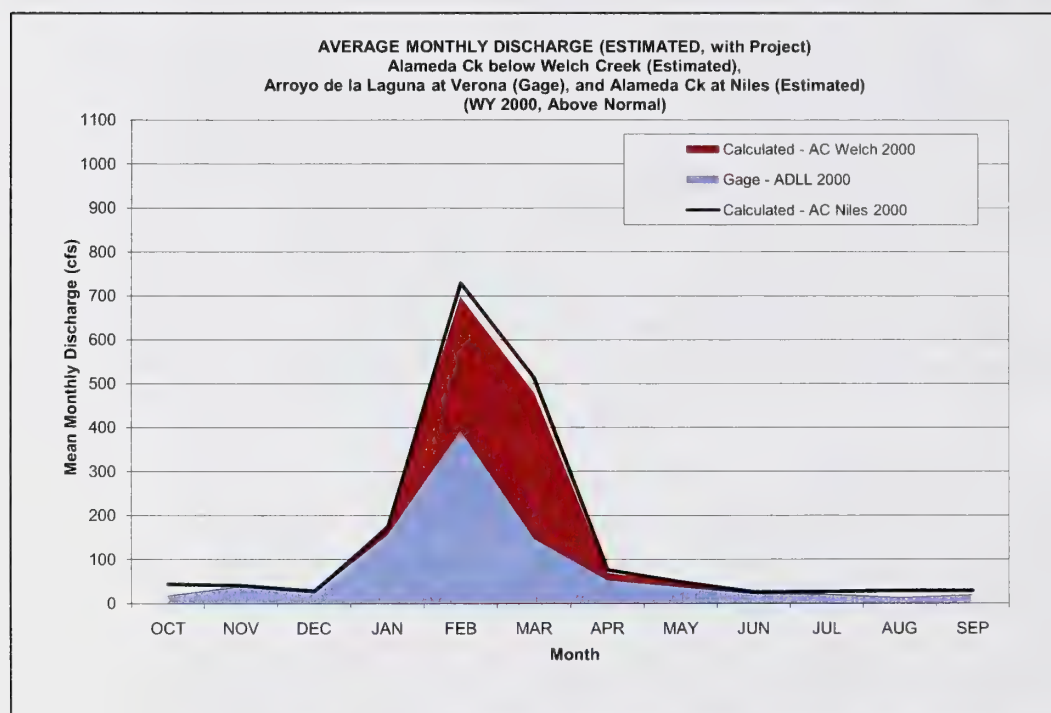
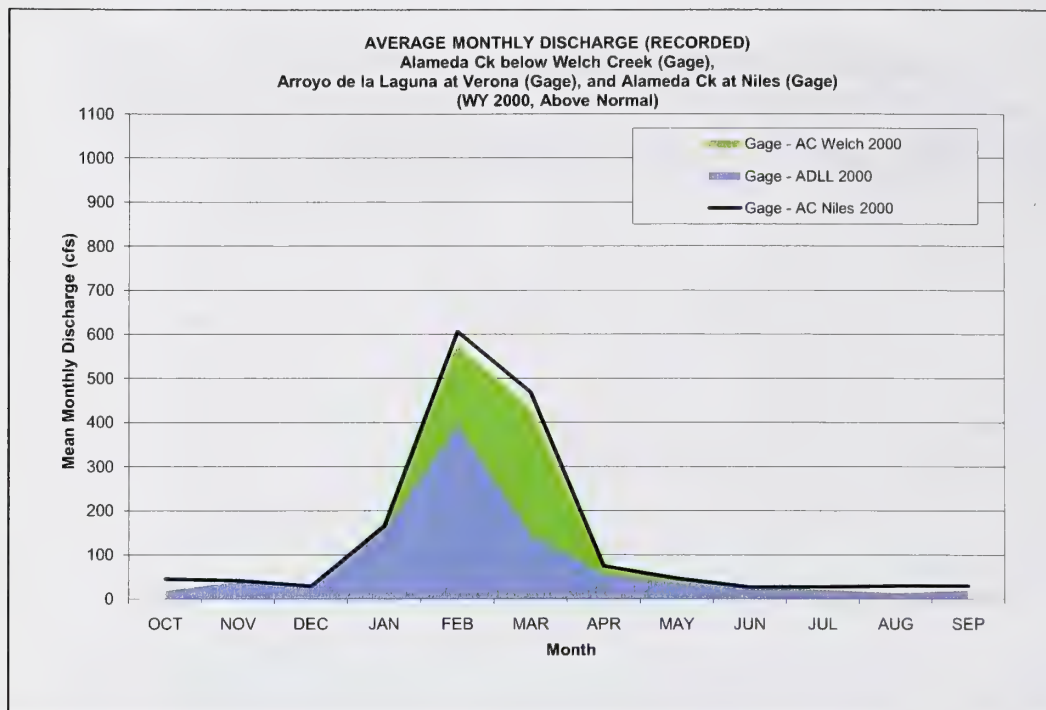
Calaveras Dam Replacement Project ■ 2005.0161E

Figure D.3-3
Comparison of Average Monthly Flow at the AC Niles Gage
Recorded Flow versus Calculated Flow under the CDRP and WSIP

D.3.2.5 LIMITATIONS OF THE ANALYTICAL RESULTS

- The data are based on monthly flows and do not reflect the range of fluctuations that occur during shorter time intervals. However, the monthly data provide a sufficient level of detail to determine the general magnitude of the effects on flow in lower Alameda Creek, as well as the season and water year type in which the effects would occur. The monthly data also provide a definitive indication of when no changes would occur.
- The discrepancy between the model prediction for flow in Alameda Creek below the San Antonio Creek confluence and the application of these flow reductions to the AC Welch Gage may introduce some error. The model flow predictions include the flow contribution from the watershed between Welch Creek and the San Antonio Creek confluence, and the flow contribution from San Antonio Reservoir releases. However, releases from the reservoir are very infrequent, and the contribution from the watershed between Welch and San Antonio Creeks is minor.
- As discussed previously, this analysis did not account for losses to groundwater in the Sunol Valley. Losses to groundwater can be significant, and inclusion of this assumption in the analysis would decrease the upper Alameda Creek contribution to flow at the AC Niles Gage and would mute the impacts of the project, particularly if the future condition assumes less loss to groundwater with implementation of the slurry wall project adjacent to the Sunol Quarries. The current analysis is therefore conservative; however, including a quantified loss to groundwater in the Sunol reach was considered too speculative.
- A Wet year is not included in the analysis because one was not present in the available gage record. A Wet year could be synthesized; however, since the greatest effects of the WSIP are shown to occur in Above Normal and Normal years, the current analysis includes the year types with the greatest impact on flows.
- Actual upstream operations in the upper Alameda Creek and ADLL watersheds were not accounted for in the analysis. For instance, large spikes in flow in 2005 and 2006 are likely a result of DSOD-restricted operations as well as releases made from Calaveras Reservoir for the flow/infiltration studies in the Sunol Valley. The additional releases for these studies had the effect of increasing upper Alameda Creek's flow contribution at the Niles Gage. Similar operational anomalies could be reviewed for the ADLL watershed and used to refine the flow percentages from the upper watersheds, but such an effort exceeded the scope of this analysis.

D.3.1 ANNUAL FLOW IN ALAMEDA CREEK AT THE NILES GAGE, WATER YEARS 2000–2007 – EXISTING CONDITION AND WITH IMPLEMENTATION OF THE CDRP/WSIP



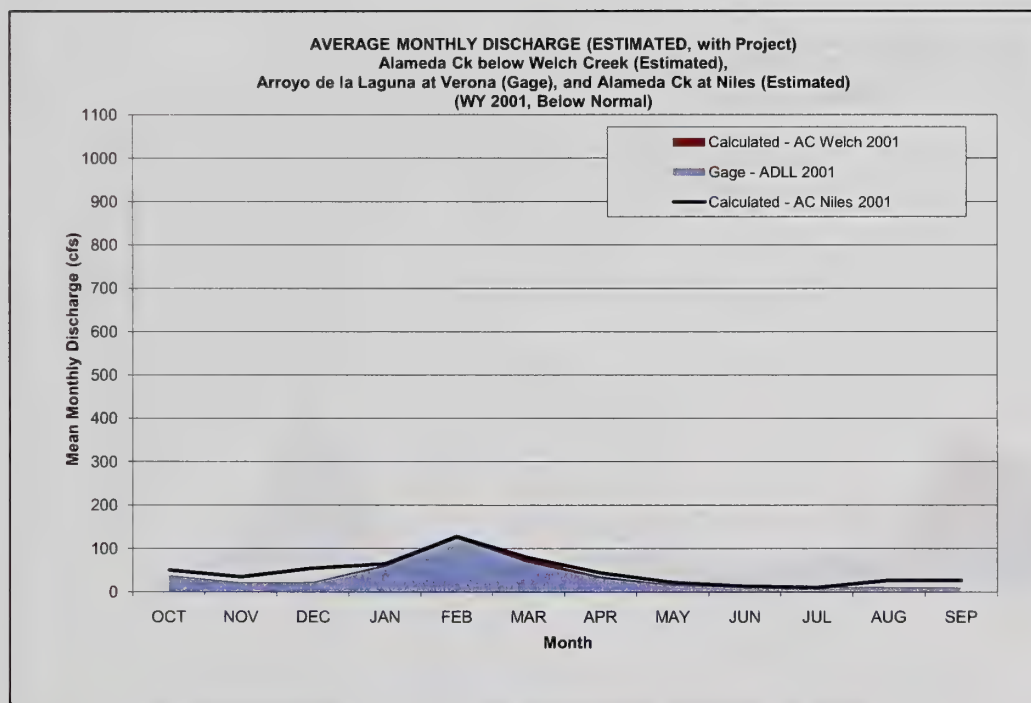
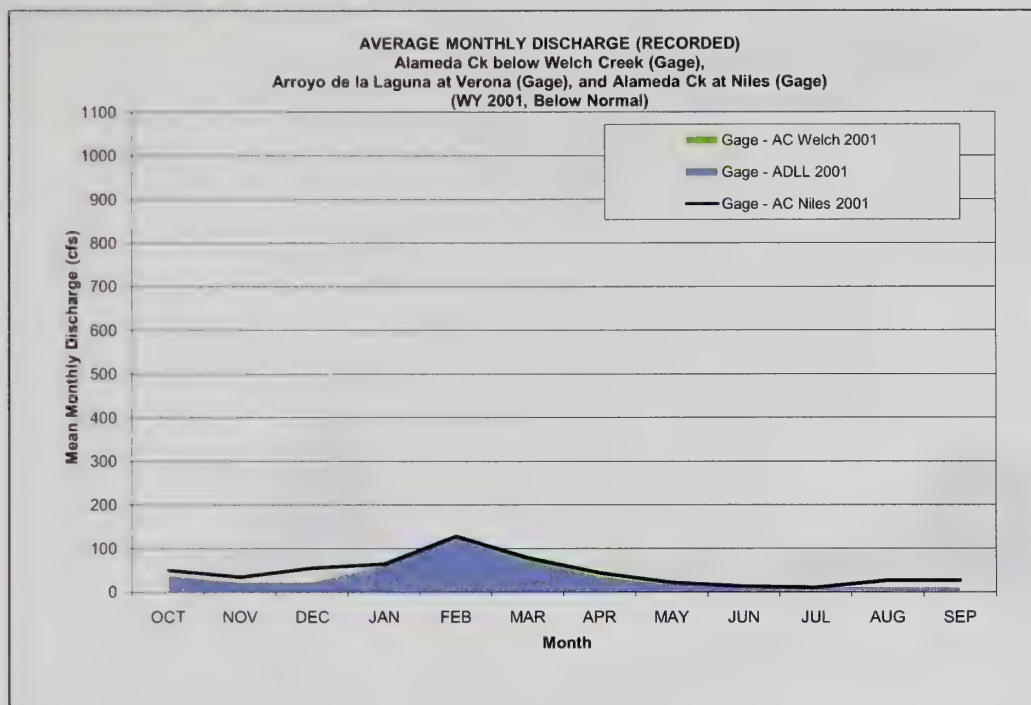
AC below Welch Ck, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2000	0	1	2	17	183	287	13	8	3	2	1	1
2000	0	1	2	23	305	331	16	10	3	2	1	1
Delta	0	0	0	6	122	44	2	3	0	0	0	0
Delta %	0%	0%	26%	38%	67%	15%	18%	38%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2000	44.3	40.8	27.9	164.9	606.3	468.5	73.5	45.8	26.1	27.1	28.8	28.6
2000	44.3	40.8	28.3	171.2	728.1	512.8	75.9	48.7	26.1	27.1	28.8	28.6
Delta	0	0	0	6	122	44	2	3	0	0	0	0
Delta %	0%	0%	1%	4%	20%	9%	3%	6%	0%	0%	0%	0%

Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%



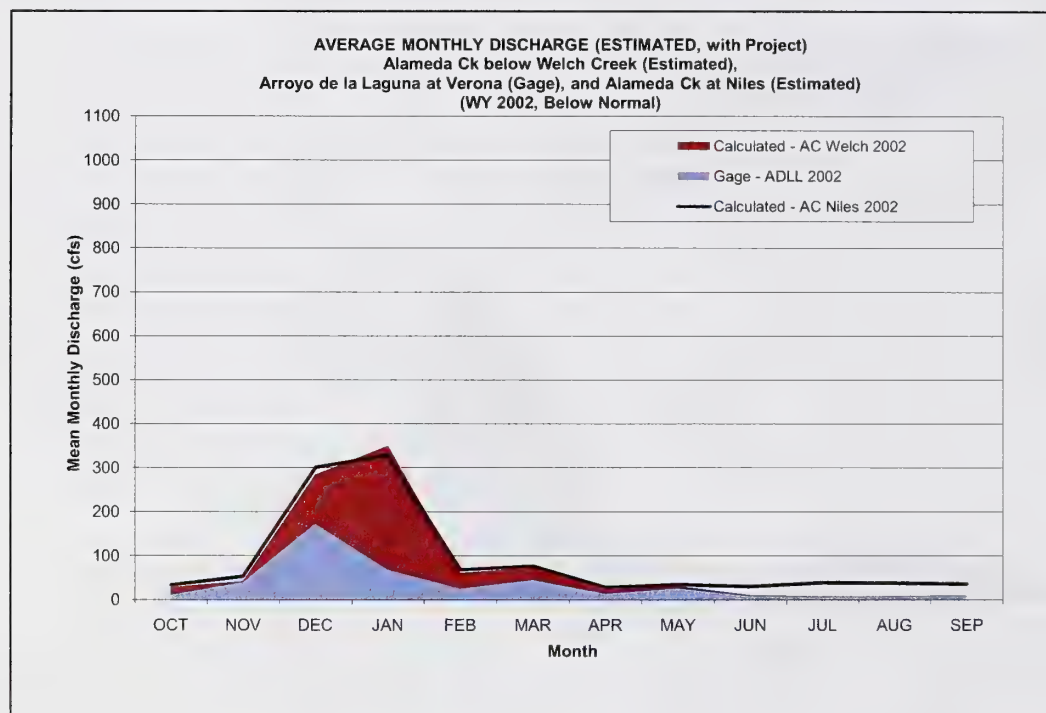
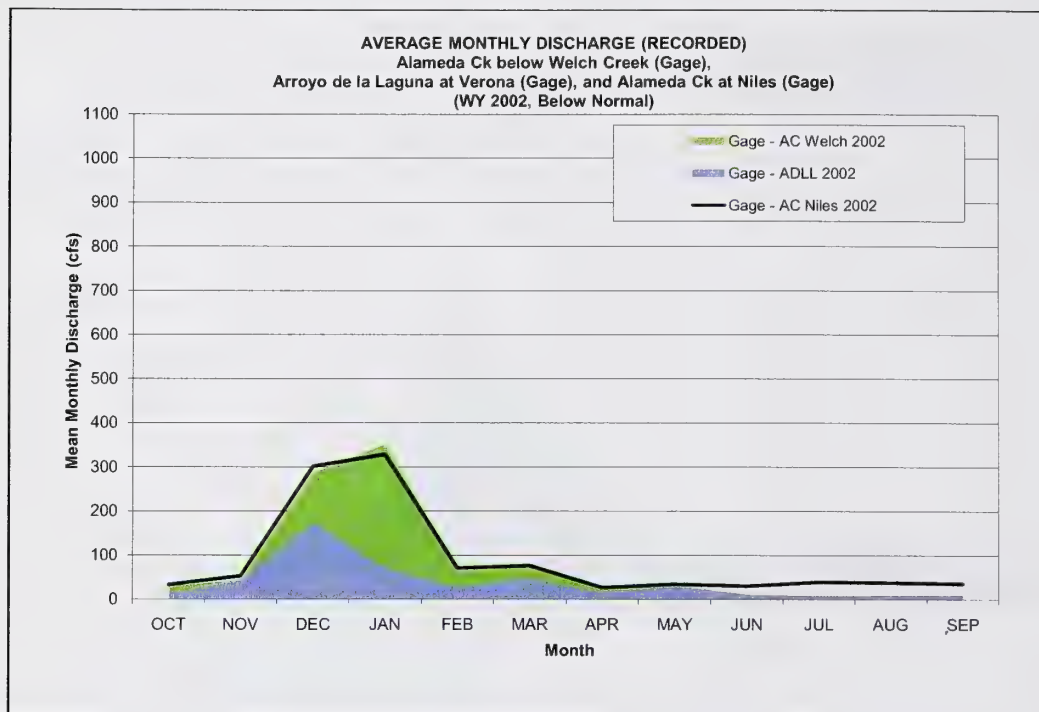
AC below Welch Ck, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2001	0.9	1.0	1.1	2.9	7.1	8.0	3.5	1.7	0.9	0.4	0.3	0.1
2001	0.9	1.0	1.1	2.9	7.1	8.0	3.5	1.7	0.9	0.4	0.3	0.1
Delta	0	0	0	0	0	0	0	0	0	0	0	0
Delta %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2001	50.2	34.8	55.1	64.8	127.8	78.9	43.7	21.8	13.6	10.4	26.7	26.6
2001	50.2	34.8	55.1	64.8	127.8	78.9	43.7	21.8	13.6	10.4	26.7	26.6
Delta	0	0	0	0	0	0	0	0	0	0	0	0
Delta %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%



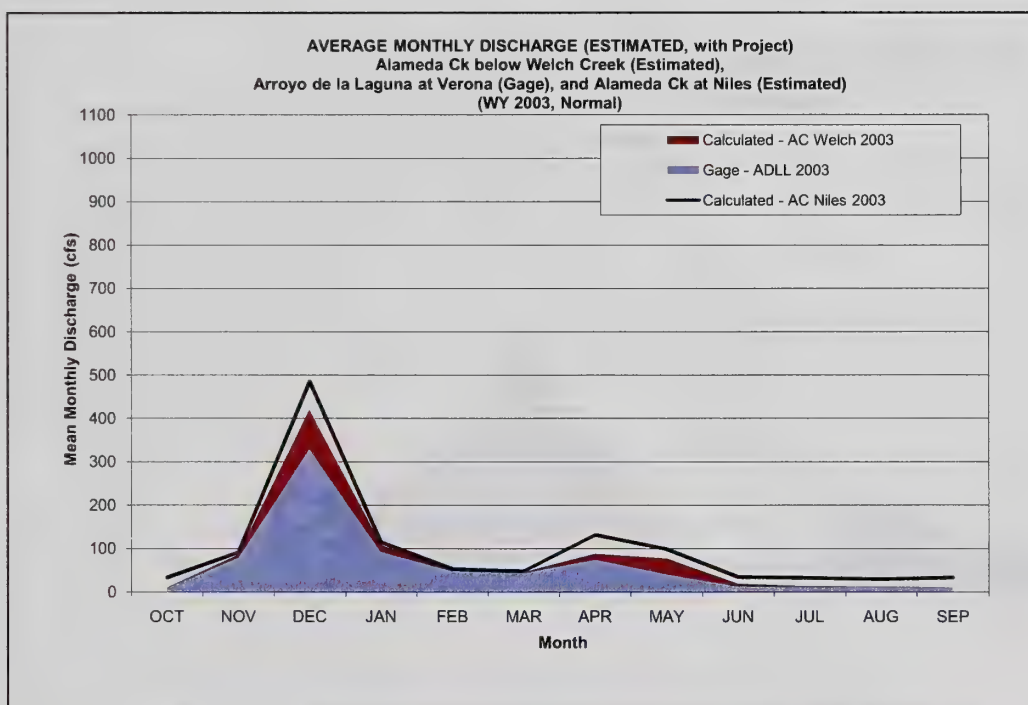
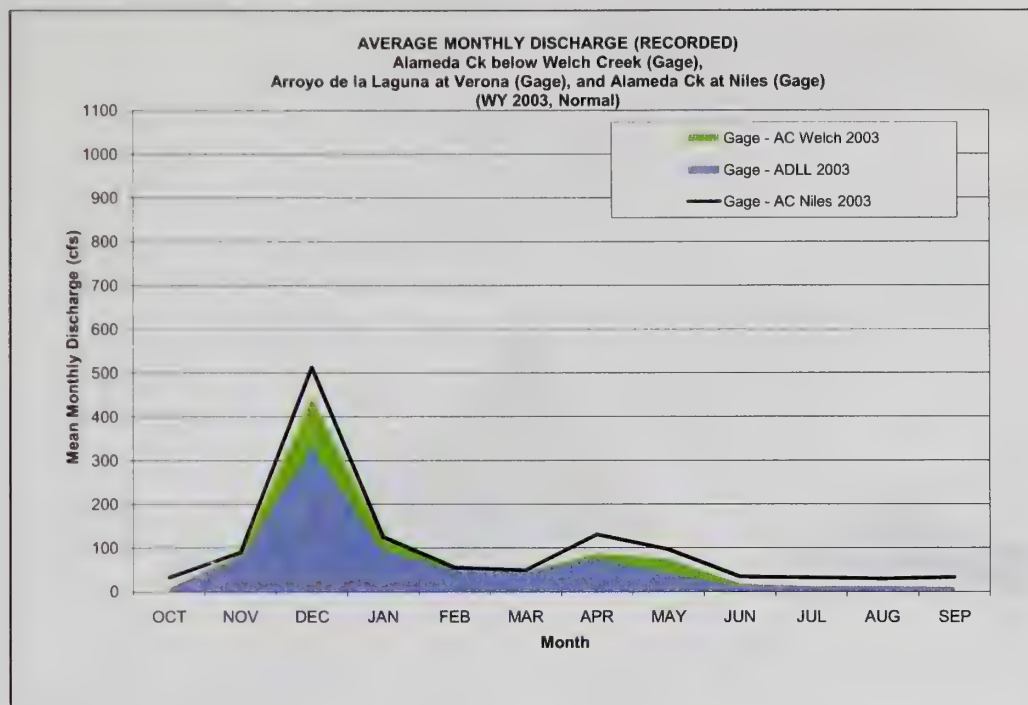
AC below Welch Ck, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2002	17.2	0.9	111.5	281.9	36.9	27.8	7.7	4.3	1.9	0.7	0.1	0.0
2002	17.2	0.9	111.5	281.9	34.7	28.4	9.2	4.3	1.9	0.7	0.1	0.0
Delta	0	0	0	0	-2	1	2	0	0	0	0	0
Delta %	0%	0%	0%	0%	-6%	2%	20%	0%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2002	32.8	53.1	301.5	328.5	70.6	76.2	26.6	34.4	30.1	39.1	38.2	35.7
2002	32.8	53.1	301.5	328.5	68.4	76.8	28.1	34.4	30.1	39.1	38.2	35.7
Delta	0	0	0	0	-2	1	2	0	0	0	0	0
Delta %	0%	0%	0%	0%	-3%	1%	6%	0%	0%	0%	0%	0%

Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%



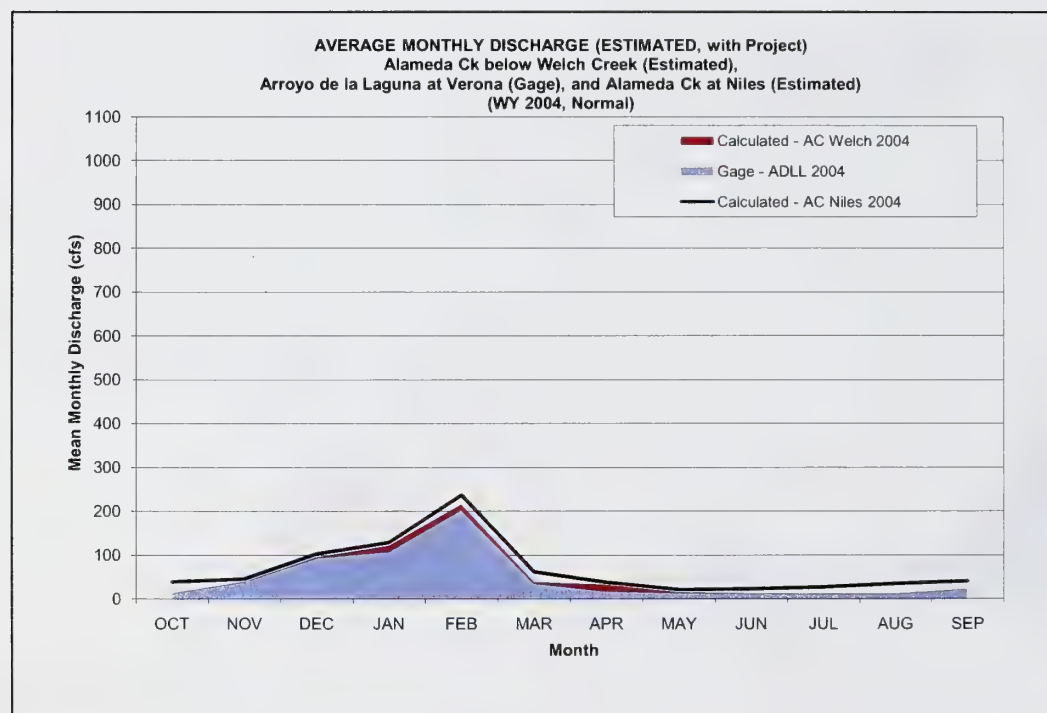
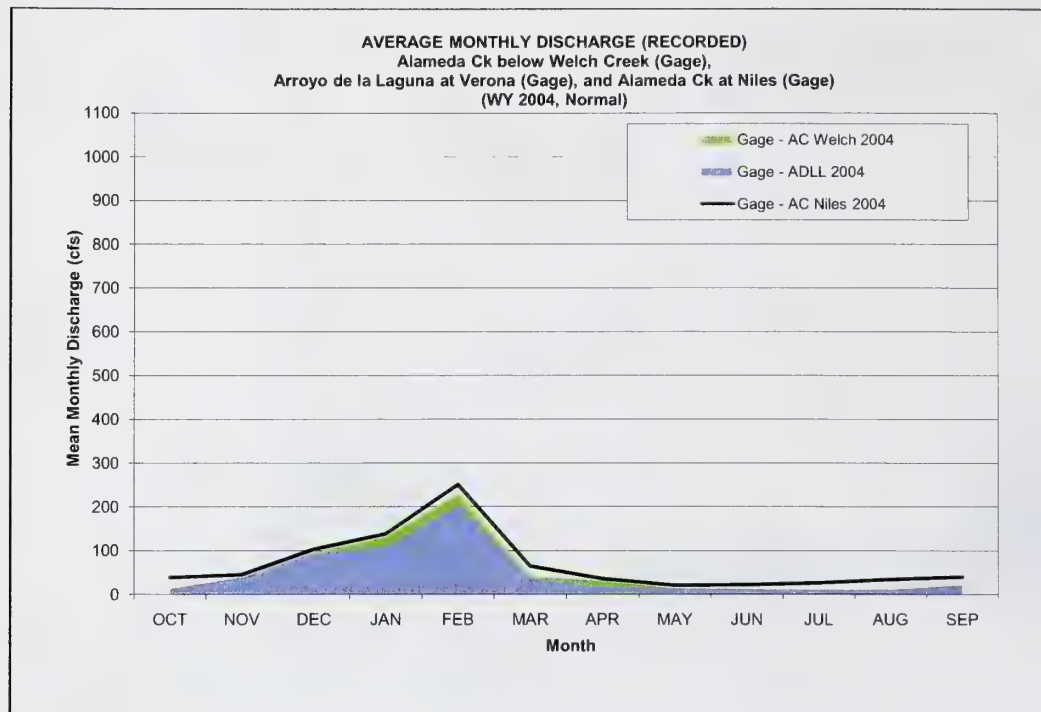
AC below Welch Ck, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2003	0.1	5.4	117.4	26.0	5.0	2.7	11.1	33.8	4.9	0.8	0.2	0.1
2003	0.1	5.4	89.9	15.0	2.3	1.6	12.2	35.6	4.9	0.8	0.2	0.1
Delta	0	0	-27	-11	-3	-1	1	2	0	0	0	0
Delta %	0%	0%	-23%	-42%	-55%	-41%	10%	5%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2003	33.6	91	513.3	126	56.1	49.7	131.1	97.3	34.9	32.7	29.7	33
2003	33.6	91.0	485.8	115.0	53.4	48.6	132.2	99.1	34.9	32.7	29.7	33.0
Delta	0	0	-27	-11	-3	-1	1	2	0	0	0	0
Delta %	0%	0%	-5%	-9%	-5%	-2%	1%	2%	0%	0%	0%	0%

Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%



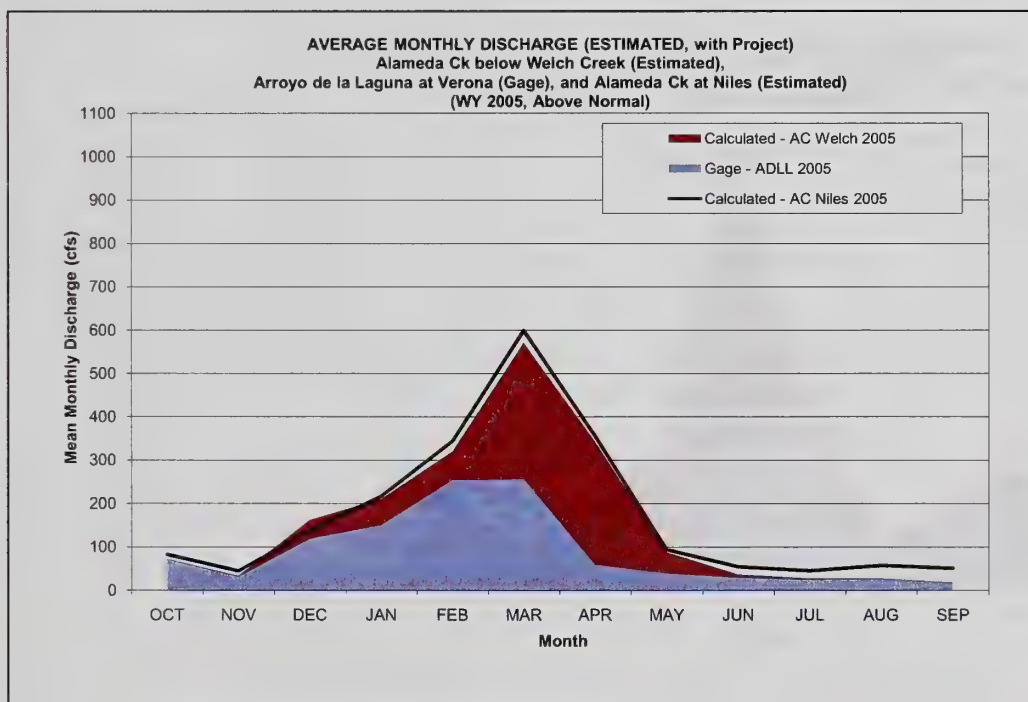
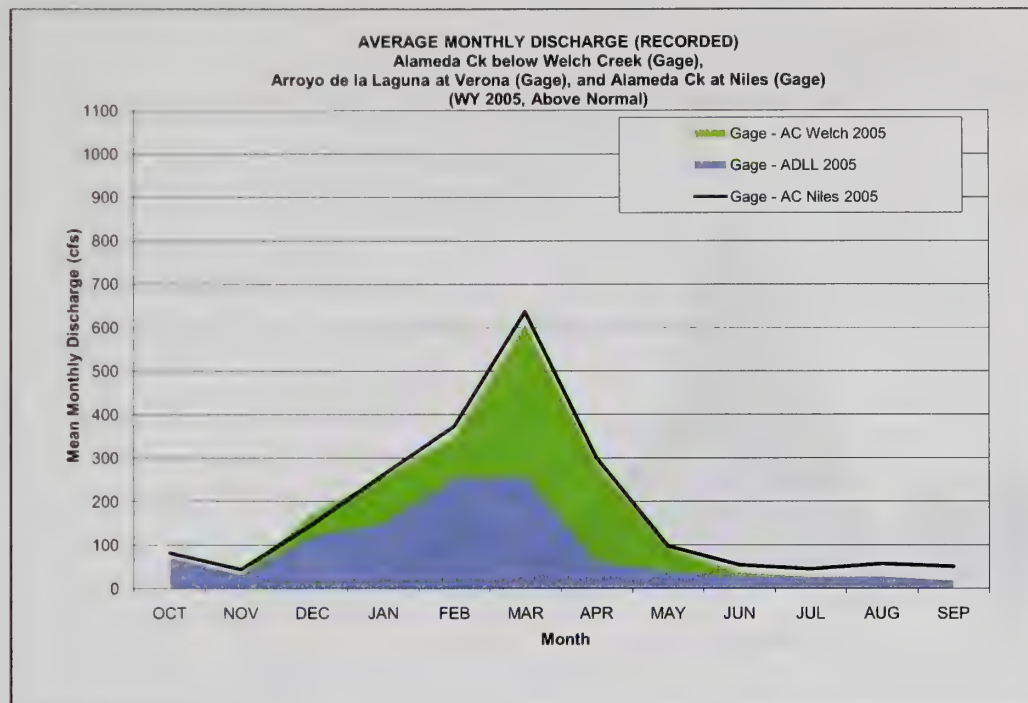
AC below Welch Ck, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2004	0.2	0.4	1.8	23.5	25.6	5.2	14.2	1.3	0.3	0.2	0.0	0.0
2004	0.2	0.4	1.3	13.6	11.6	3.1	15.6	1.4	0.3	0.2	0.0	0.0
Delta	0	0	0	-10	-14	-2	1	0	0	0	0	0
Delta %	0%	0%	-23%	-42%	-55%	-41%	10%	5%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2004	39	45.4	103.5	138.4	251.1	64.5	36.1	21.1	22.8	27	34.9	40.7
2004	39.0	45.4	103.1	128.5	237.1	62.4	37.5	21.2	22.8	27.0	34.9	40.7
Delta	0	0	0	-10	-14	-2	1	0	0	0	0	0
Delta %	0%	0%	0%	-7%	-6%	-3%	4%	0%	0%	0%	0%	0%

Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%



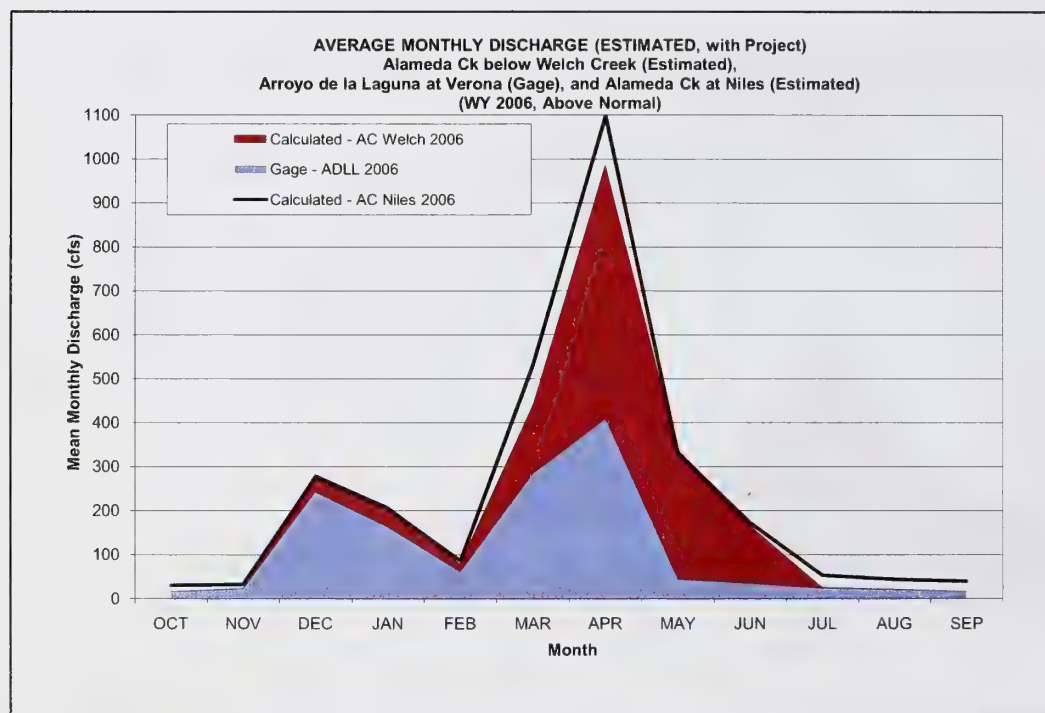
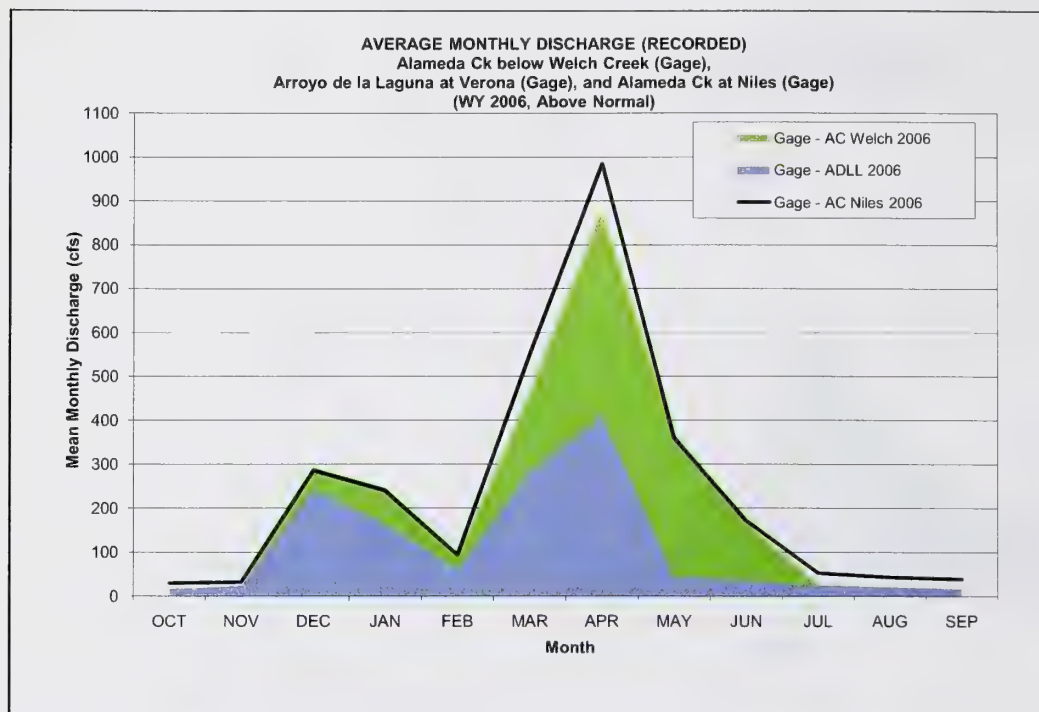
AC below Welch Ck, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2005	0.3	0.6	53.4	106.1	94.9	351.4	227.1	52.8	6.7	2.5	0.6	0.4
2005	0.3	0.6	43.2	60.2	65.9	313.0	281.9	48.0	6.7	2.5	0.6	0.4
Delta	0	0	-10	-46	-29	-38	55	-5	0	0	0	0
Delta %	0%	0%	-19%	-43%	-31%	-11%	24%	-9%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2005	82.5	44.5	147.8	262.4	373.8	637.6	300.1	98.3	54.5	45.5	57.2	51.1
2005	82.5	44.5	137.6	216.5	344.8	599.2	354.9	93.5	54.5	45.5	57.2	51.1
Delta	0	0	-10	-46	-29	-38	55	-5	0	0	0	0
Delta %	0%	0%	-7%	-17%	-8%	-6%	18%	-5%	0%	0%	0%	0%

Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%



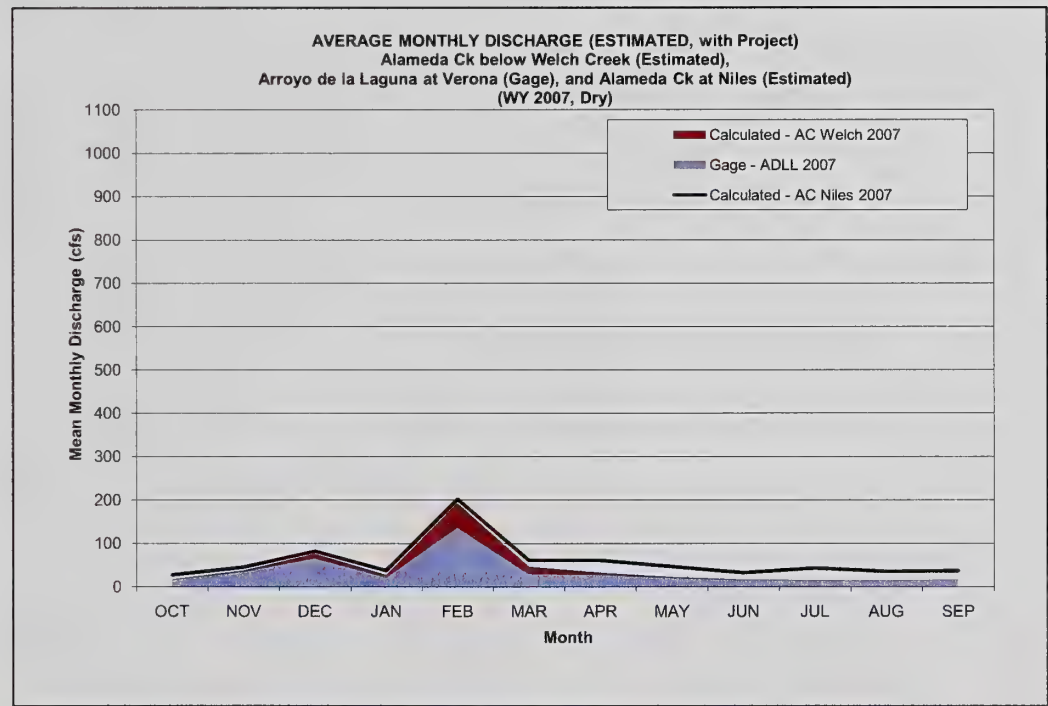
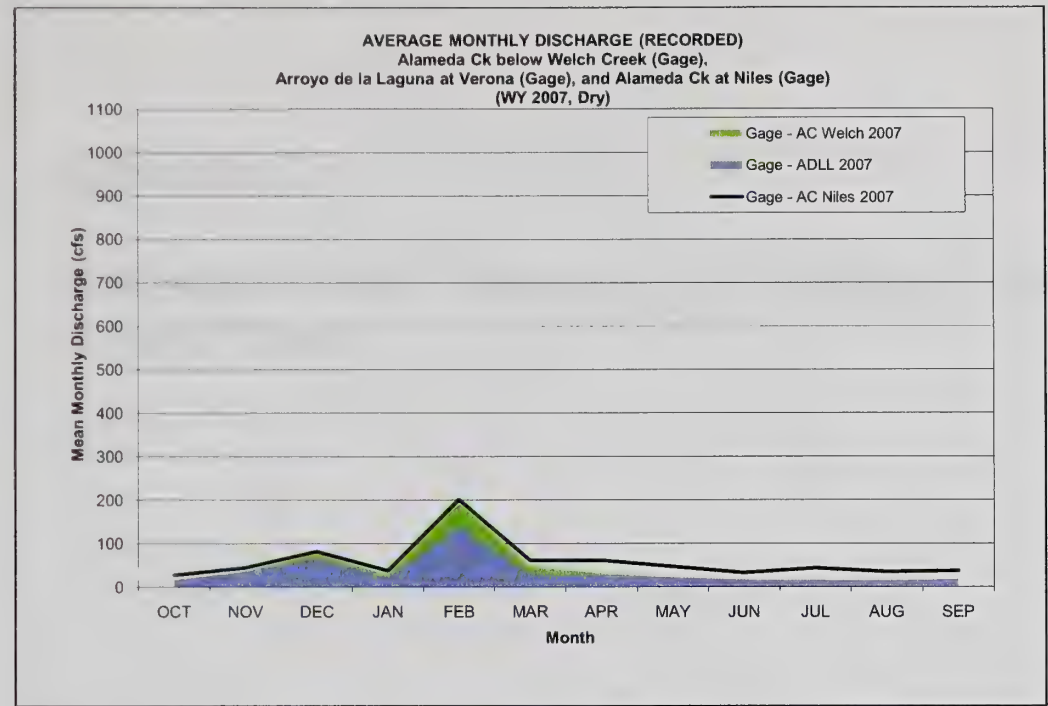
AC below Welch Ck, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2006	0.3	0.6	50.7	83.5	27.4	177.0	465.9	324.9	132.5	2.2	1.0	0.4
2006	0.3	0.6	41.0	47.4	19.0	157.6	578.3	295.5	132.5	2.2	1.0	0.4
Delta	0	0	-10	-36	-8	-19	112	-29	0	0	0	0
Delta %	0%	0%	-19%	-43%	-31%	-11%	24%	-9%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2006	30.3	32.2	286.8	241.5	94.4	551	985.9	361.1	172.3	53.1	43.7	39.3
2006	30.3	32.2	277.1	205.4	86.0	531.6	1098.3	331.7	172.3	53.1	43.7	39.3
Delta	0	0	-10	-36	-8	-19	112	-29	0	0	0	0
Delta %	0%	0%	-3%	-15%	-9%	-4%	11%	-8%	0%	0%	0%	0%

Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%



AC below Welch Ck, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2007	0.6	1.8	9.9	5.1	55.8	16.4	4.4	2.0	0.8	0.3	0.1	0.0
2007	0.6	1.8	9.9	5.1	55.8	16.4	4.4	2.0	0.8	0.3	0.1	0.0
Delta	0	0	0	0	0	0	0	0	0	0	0	0
Delta %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w 2018 CDRP & WSIP

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2007	27.6	45.1	81.8	37.5	201.6	61	60.9	47	32.4	43.4	35.1	36.9
2007	27.6	45.1	81.8	37.5	201.6	61.0	60.9	47.0	32.4	43.4	35.1	36.9
Delta	0	0	0	0	0	0	0	0	0	0	0	0
Delta %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Increase of greater than 1% Decrease of greater than 1% Decrease of greater than 5%

Appendix D.4

Analysis of WSIP Operation on Alameda Watershed Stream Flows

Memorandum

Subject: Analysis of WSIP Operation on Alameda Watershed Stream Flows

From: Daniel B. Steiner

Date: September 3, 2009

1. Introduction

This memorandum summarizes an expanded evaluation of the potential effects of the WSIP on the hydrology of certain stream segments in the Alameda Creek watershed and the operations of SFPUC Regional Water System facilities.¹ The evaluation is based on a contrast of HH/LSM results for the simulation of the WSIP against the simulation of operations under existing conditions. The focused subjects of this expanded evaluation are the noted stream reaches of the watershed shown in Figure 1, referred to as 1) Alameda Creek below Alameda Creek Diversions Dam, 2) Calaveras Creek below Calaveras Dam, and 3) Alameda Creek below Confluence. These stream reaches are affected by the operation of the SFPUC's Alameda Creek Diversion Dam and Calaveras Reservoir.

The operation of the Alameda Creek Diversion Dam and Calaveras Reservoir has been evaluated previously within the context of the San Francisco Public Utilities Commission's Water Supply Improvement Program (WSIP) studies undertaken in the Program Environmental Impact Report (PEIR). Those evaluations included modeled operations of the dam and reservoir under an "existing" setting that assumed the existing Regional Water System (system) configuration. The operation of Calaveras Reservoir assumed a maximum operating storage of 12.4 BG consistent with objectives established with the Department of Safety of Dams. In the existing setting, no mandated stream releases from Alameda Creek Diversion Dam or Calaveras Reservoir occur.

The modeling studies prepared prior to the adoption of the Phased WSIP Variant ("2018 WSIP") assumed WSIP improvements to the system that included restoring Calaveras Reservoir to full operating capacity (31.5 BG). The studies also assumed implementation of the California Department of Fish and Game Memorandum of Understanding (MOU) stream flow objectives, with the flow at the Alameda Creek/Calaveras Creek confluence (confluence) supplemented from releases from Calaveras Reservoir and recaptured for treatment at Sunol Valley Water Treatment Plant (SVWTP). Since the completion of the explicit PEIR modeling studies, a component of the WSIP configuration concerning the implementation of the MOU flows has been refined. The stream flow objective for Alameda Creek (with compliance measured at the confluence) remains consistent with the MOU. However, in the refined configuration, the primary source of water for compliance at the confluence is the Alameda Creek Diversion Dam (ACDD), when available, instead of Calaveras reservoir. Releases would be made from Calaveras Reservoir, if necessary, to supplement water released at ACDD.

The results of the revised 2018 WSIP Setting described in this memorandum focus upon the operation of ACDD and Calaveras Reservoir, and the resulting stream flow hydrology below these facilities. The operation of ACDD and Calaveras Reservoir are simulated by the use of the Hetch Hetchy/Local Simulation Model (HH/LSM), which is a system-wide monthly time-step operations planning tool used by the SFPUC. HH/LSM uses a scenario-specific system configuration and system water demand over an 82-year historic hydrology (1921–2002) to project operations that might result if that 82-year hydrology recurs. The utility of model simulations is the comparison of results between different scenarios of system configuration, water demand and system operation. This memorandum demonstrates the comparison between the revised 2018 WSIP setting and the existing condition setting.

¹ This memorandum supplements an earlier document 2018 WSIP Model Run with Crystal Springs Restricted and Alameda Creek Diversion Dam as the Primary Source of In-Stream Releases, April 29, 2009 by David Cameron and Daniel Steiner.

Figure 1
Calaveras Dam Vicinity and Stream Reaches

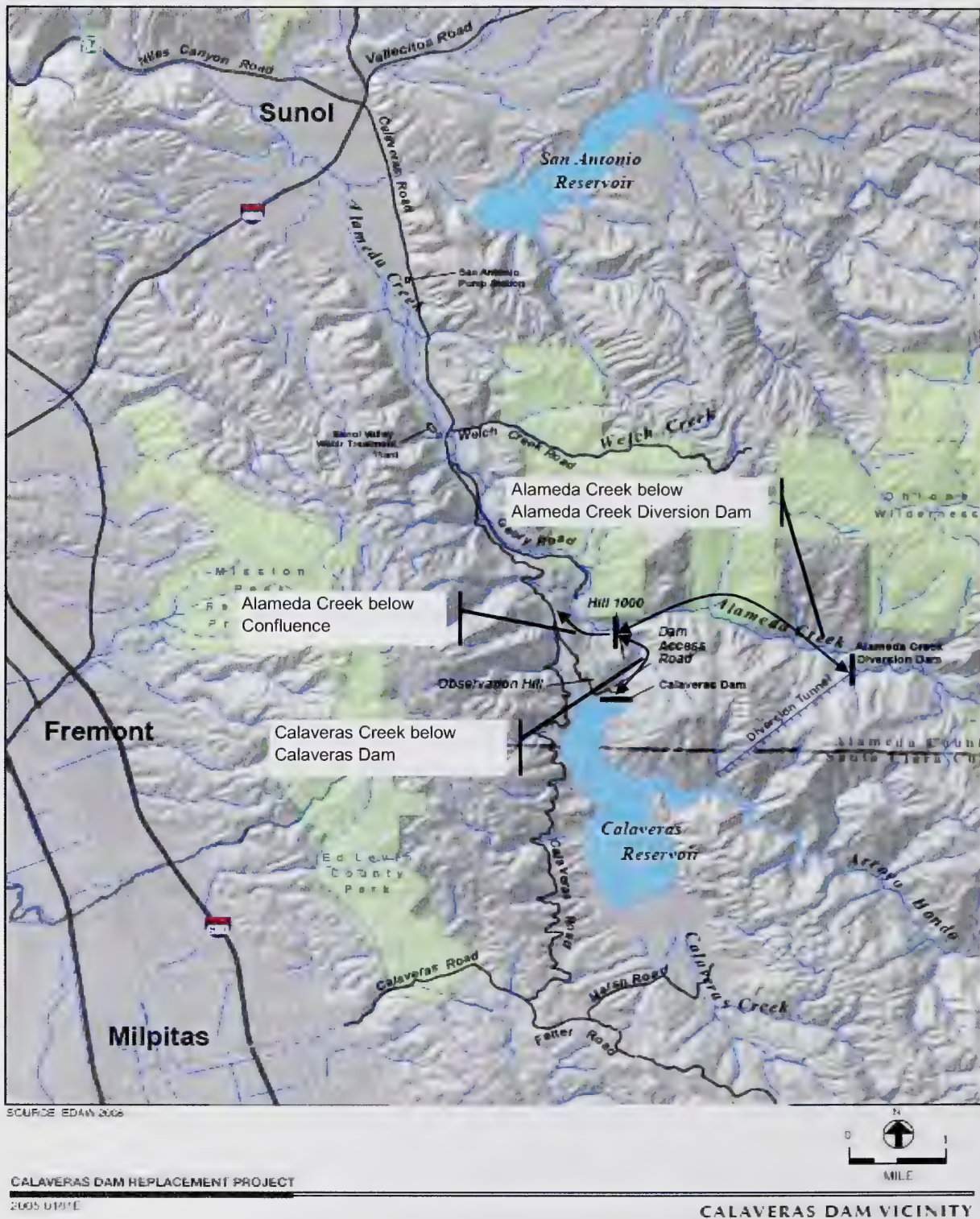


Figure adapted from EDAW 2009

2. Description of Operation

The SFPUC operates the Alameda Creek watershed reservoir system to manage water captured from local watershed runoff and water conveyed from the Hetch Hetchy system. A primary objective of the local reservoir system is to conserve local watershed runoff for delivery. The local reservoir system's operation is seasonally driven. During the winter season, when rainfall and local watershed runoff occurs, the local reservoirs are managed to maintain sufficient available storage in the reservoirs in order to minimize spills from the reservoirs. In anticipation of or subsequent to storm events, runoff is conveyed to the Sunol Valley WTP to maintain reservoir storage at winter storage objective levels. Towards the end of the winter as the likelihood of rain decreases, the reservoirs are operated to capture local watershed runoff with a goal of maximizing storage carried into the late-spring and summer seasons.

During the summer, water drawn from the local reservoirs is minimized in order to preserve stored water so it is available in the event of a disruption of flow from the Hetch Hetchy system (San Joaquin Pipelines) or unplanned outages within the system. As the system demand increases past the capacity of flow from the Hetch Hetchy system, water is drawn from the local reservoirs to serve demands. At the beginning of fall, if the demand on local reservoir supplies has not drawn each reservoir down to its winter-time storage objective level, conveyance between the reservoirs, Hetch Hetchy system flow rates, and treatment plant flow rates are adjusted to reach winter storage objective levels. However, if storage levels are below objectives, additional water may be conveyed from the Hetch Hetchy system to replenish or retain stored water.

Calaveras Reservoir's inflow is supplemented by diversions from Alameda Creek through the Alameda Creek Diversion Dam and Tunnel. The typical operation of the diversion is to divert flow from Alameda Creek when it is available up to the capacity of the tunnel. Flow at the diversion site that exceeds the diversion capacity will flow over the diversion dam and contribute to flows in Alameda Creek downstream of the dam. Other than debris-flushing operations normally at the beginning and end of the rainy-season, the diversion tunnel will remain open. The exception to this operation is when Calaveras Reservoir is at or nearing its maximum level. During these periods, the gates to the diversion tunnel are closed and all Alameda Creek flow passes the diversion dam. The closed-gate operation is more prevalent under the current DSOD restricted-operation condition of Calaveras Reservoir.

Deliveries from Calaveras Reservoir to Sunol Valley WTP are utilized to maintain preferred storage levels in the reservoir and to meet system water deliveries. The amount of water that can be drafted to Sunol Valley WTP can at times be constrained by system water deliveries and the need to draft water from the Peninsula reservoirs. During those constrained instances, flows to the Peninsula will be rejected. In instances when Calaveras Reservoir exceeds its preferred storage level and Sunol Valley WTP is constrained, the SFPUC can transfer Calaveras Reservoir water to San Antonio Reservoir if reservoir space is available (currently a rarity at the time of opportunity) in the reservoir. Spills (releases) to Calaveras Creek will occur from the reservoir when inflow exceeds reservoir storage availability and draft to Sunol Valley WTP.

Calaveras Reservoir operations also affect the operation of Alameda Creek diversions at the Alameda Creek Diversion Dam. Diversion of flow at the diversion dam to Calaveras Reservoir occurs whenever Calaveras Reservoir is below its maximum storage level. Water not diverted to Calaveras Reservoir continues past the diversion dam and contributes to flow that reaches the Alameda Creek and Calaveras Creek confluence.

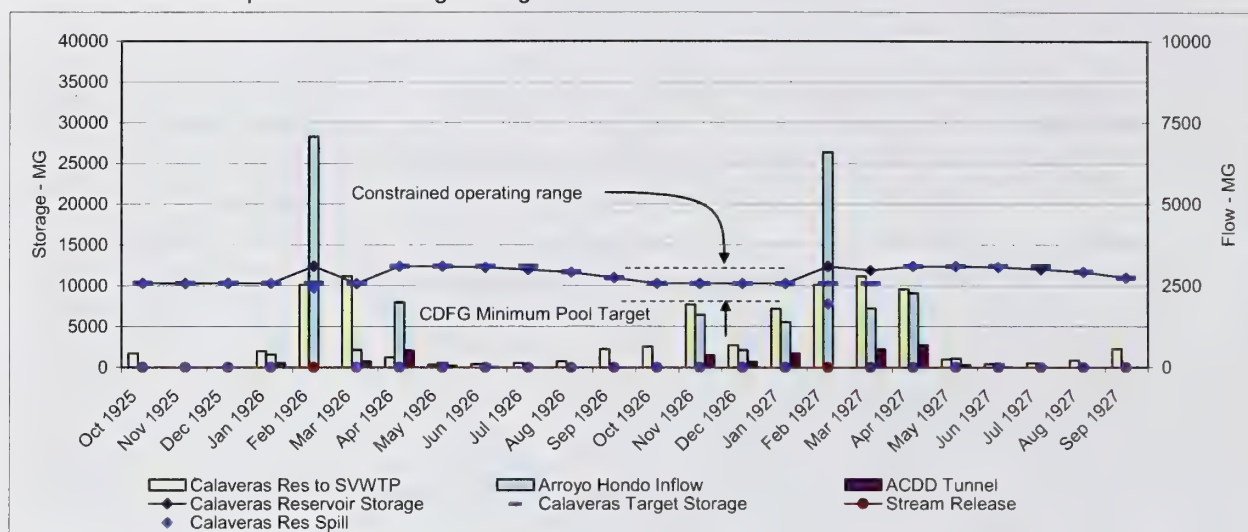
The MOU flow objective at the Calaveras Creek and the Alameda Creek confluence would be met through releases of available inflow at Alameda Creek Diversion Dam and unregulated flows that occur below the diversion dam and Calaveras Dam. If that flow is not sufficient to meet the flow objective, additional supplemental flow would be released from Calaveras Dam. Modeling currently assumes that supplemental releases are recaptured by a downstream facility and transferred into the water supply system at Sunol Valley WTP.

2.1 Example of Calaveras Reservoir Operation – Current Constrained Operation

Numerous hydrologic and system operation factors influence the operation of Calaveras Reservoir and the facilities and streams that are affected by its operation. An example of a 2-year sequence of operation (as modeled by HH/LSM) is illustrative of these factors. This particular sequence has been selected to illustrate an example of a unique change in anticipated system operation resulting from the 2018 WSIP, and to illustrate that changes in operational outcomes differ from year to year.

Figure 2.1-1 illustrates a simulated operation of Calaveras Reservoir for a sequence of 24-months, with system operation consistent with the current existing setting including a constrained reservoir elevation at the reservoir.

Figure 2.1-1
Calaveras Reservoir Operation – Existing Setting



Several components of system operation are illustrated. In the background of the Calaveras Reservoir operation is an objective to maintain the storage no greater than the DSOD maximum pool elevation objective of 705 feet (approximately 12,400 MG), and to not draw storage below the CDFG minimum pool target of 690 feet (approximately 8,400 MG). Combined these objectives become the modeled constrained operating range. To operate within this range and continue to effectively utilize some of the watershed's runoff for water supply, target storage levels are identified that provide guidance for reservoir management. This guidance suggests drawing reservoir storage down during the fall and winter below the DSOD maximum pool elevation objective in order to provide a buffer to absorb storm runoff events. When inflow encroaches into this buffer zone water is released to SVWTP in order to reestablish the buffer zone. During the spring as the likelihood of storm events diminish, the target storage level increases up to the DSOD maximum pool elevation objective, which provides for the capture of late season runoff into storage for system demands during the summer.

Due to the very constrained operating range caused by the DSOD objective and the CDFG minimum pool target, only a limited amount of storage is used to regulate within-year storm events or provide seasonal management of runoff. However, the general rules of system operation still apply to this constrained operation: maintaining water in storage at Calaveras Reservoir is still a priority. Water is primarily released to SVWTP only when passage of inflow or evacuation of storage is suggested to operate near the target storage levels. The exception of this rule is when system deliveries exceed Tuolumne River imports during the summer and local system storage releases are needed to meet deliveries. During these times the call for water from any particular local reservoir is dependent on several considerations, and in the constrained circumstance of Calaveras Reservoir its production has been lessened.

Shown in Figure 2.1-1 are the components of Calaveras Reservoir inflow and releases. The components of inflow from Arroyo Hondo and the Alameda Creek Diversion Dam Tunnel, and releases to SVWTP are

illustrated (as vertical bars). Under the existing setting that does not include implementation of the MOU, the occurrence of inflow from Alameda Creek is dependent upon two conditions: 1) inflow to Alameda Creek Diversion Dam, and 2) the ability of Calaveras Reservoir to store the diversion or to pass the diversion to SVWTP. It is assumed that the diversion is available (i.e., tunnel gates open) except when storage in Calaveras Reservoir is projected (for a month) to be greater than the maximum allowed storage. In the existing setting the maximum allowed storage is assumed to be the DSOD objective (view the results shown for February 1926 and February 1927).² During these instances there is typically a spill modeled at Calaveras Reservoir.³ Concurrently, water available from Alameda Creek through the diversion tunnel will be rejected and left to spill past the ACDD. Other than these periods of rejection, water would be diverted from inflow to ACDD, if present, to Calaveras Reservoir including times when the reservoir is operating at its target level.

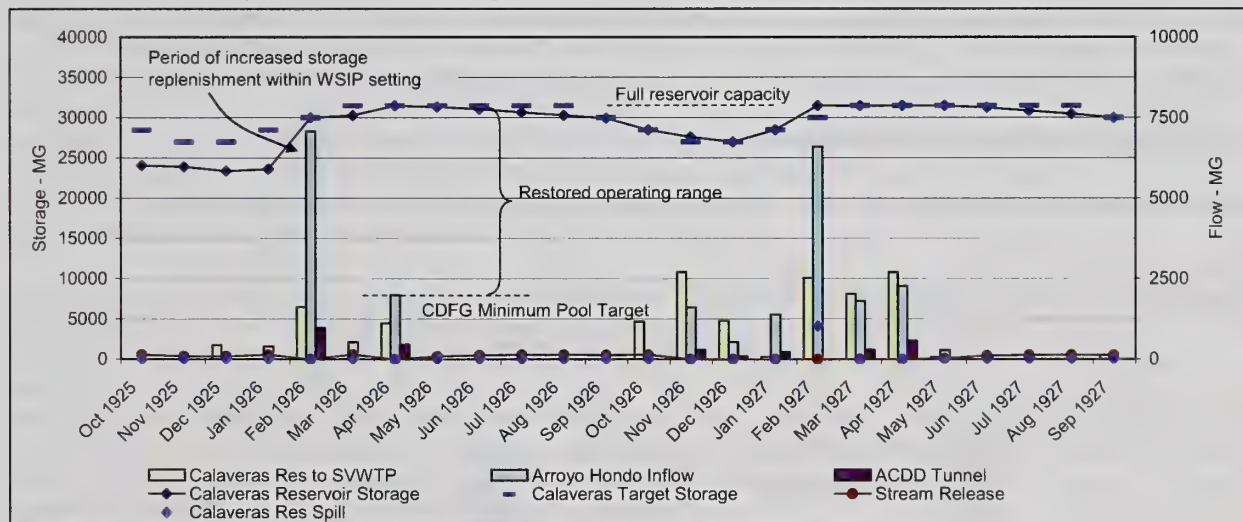
Reservoir storage is shown to only fluctuate slightly during the year, a result of the constrained operating range. A reservoir's storage is used during a year to modulate inflows with releases. In this constrained setting, releases from the reservoir generally correspond to inflows.

2.2 Example of Calaveras Reservoir Operation – WSIP Operation

Under a WSIP operation a couple components of system configuration and constraint change. The implementation of the MOU adds an underlying operating objective to the system, requiring releases to the streams to be made from facilities where in the past the requirement did not exist. The restoration of storage capacity at Calaveras Reservoir will also affect the management of flows within the watershed.

Figure 2.2-1 is an illustration of Calaveras Reservoir operations under a WSIP operation. The illustration is for the same period of study shown above for the existing, constrained setting.

Figure 2.2-1
Calaveras Reservoir Operation – WSIP Setting



Besides the fundamental change in operation due to implementation of the MOU with its flow objectives met at the confluence with supplemental releases from ACDD and Calaveras Reservoir, the changes in operation, and resulting stream flows, are mostly attributable to the affect of a restored operating range for the reservoir. Evident between the two operations is a greater cycling of reservoir storage. While in the constrained setting reservoir storage could not provide a large amount of regulation between inflows and releases, after restoration of the operating range a greater amount of regulation can occur. This larger

² Actual historical operations have illustrated that storage has been allowed to exceed the DSOD reservoir level objective during the runoff season, with such storage evacuated by the end of spring.

³ "Spill" does not necessarily mean the passage of water through the spillway. The event could be the release of water through valving.

operating range, within a year and between years can lead to a greater storage of Arroyo Hondo runoff and a different frequency of diversion from Alameda Creek. The modeled month of February 1926 is illustrative of this change.

In the constrained existing setting, during January Calaveras Reservoir is operated at its target storage level with inflow from Arroyo Hondo and ACDD being passed to SVWTP. During February, inflow from Arroyo Hondo is so great that the release to SVWTP (constrained by system water demands being met from other sources) was not sufficient to maintain Calaveras Reservoir storage at either the target storage level or within the DSOD objective. In this circumstance water available at ACDD is rejected (i.e., tunnel closed) and there is a spill to Calaveras Creek from Calaveras Reservoir.

Within the WSIP operation, the state of Calaveras Reservoir when entering February is different. At the end of January, Calaveras Reservoir storage is well below the target storage as a result of using stored water from Calaveras Reservoir for system deliveries during the previous year. This large storage draw down was not possible in the constrained setting due to the reservoir's limited operating range. With this available storage space, along with the target storage level increasing during February, a large amount of inflow is captured to storage during February. In this example, all of the Arroyo Hondo inflow is regulated (without spill) and a portion of the flow available at the ACDD is diverted to Calaveras Reservoir.

In this month of example, the diversion to Calaveras Reservoir from ACDD is greater within the WSIP operation, decreasing the amount of water that flows past ADCC to Alameda Creek. The amount of water released (spilled) from Calaveras Reservoir to Calaveras Creek also decreases. This circumstance of reduced stream releases is not always the case for each stream reach each month. For the other previously described month of discussion, February 1927, circumstances are different which lead to the same rejection of all ACDD diversions to Calaveras Reservoir, and only a reduction of some of the spill from Calaveras Reservoir to Calaveras Creek. Also, at all times (as will be described later) the implementation of MOU flow objectives at the confluence leads to many instances when flow will occur by the explicit release (bypass) of available inflow at ACDD under the WSIP operation when under the existing operation no flow would occur. Flow below Calaveras Dam above the confluence will also occur which would also not occur under existing operation, when releases from ACDD inflow are not present to fully meet MOU objectives. This circumstance particularly occurs during the summer months.

2.3 Example of ACDD Operation

The operation of ACDD under the two operation settings describe above is illustrated in Figure 2.3-1.

Figure 2.3-1
Disposition of ACDD Inflow under Existing and WSIP Operations

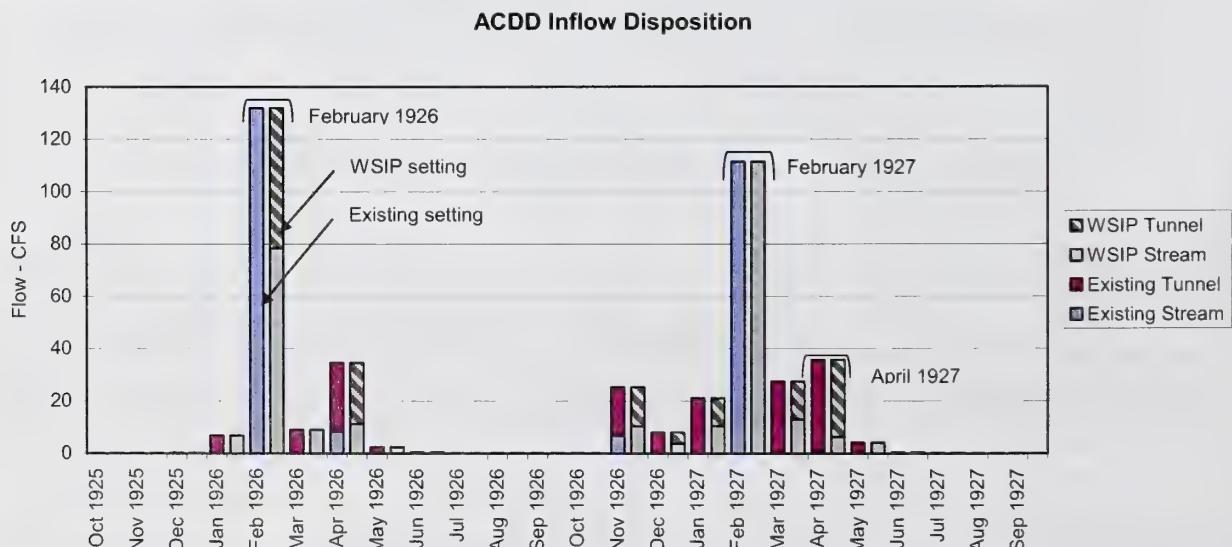


Figure 2.3-1 illustrates the disposition of inflow to ACDD for each month of the 24-month sequence. As an example, in the simulated operation for February 1926, the first bar associated with the month illustrates the disposition of inflow under the existing setting. In this instance, diversion of ACDD inflow to Calaveras Reservoir was rejected due to the constrained operation of Calaveras Reservoir leading to spills to Alameda Creek. The second bar illustrates the disposition of ACDD inflow under WSIP operations. In this instance, as described previously, a portion of ACDD inflow is diverted to Calaveras Reservoir to be stored for coincident or later release. The remaining portion of inflow continues to be passed to Alameda Creek, and in this particular example more than is needed to comply with MOU flow objectives at the confluence. The February 1927 results illustrate the same amount of flow past ACDD for the existing and WSIP operation, all of the inflow is passed under either operation.

The April 1927 results illustrate the circumstance of the existing operation diverting the entire flow at ACDD, when under the WSIP operation a portion of the inflow will be passed for compliance with the MOU flow objective. In other months of the illustrative period, e.g., January 1926, the entire inflow to ACDD would be passed under WSIP operations when under existing operations the entire inflow would have been diverted to Calaveras Reservoir.

3. Long-term HH/LSM Results

As illustrated above, the changes to stream flows between the existing and WSIP settings are dependent upon the changes to the operations of Calaveras Reservoir and the MOU. These operation changes are dependent upon several Calaveras Reservoir-related factors, the releases for the MOU, and system wide factors. Shown earlier are the simulated monthly operations for two years, which result in two different outcomes for the affected streams.

HH/LSM is used to provide insight to the frequency of change to stream flow anticipated for the WSIP operation. HH/LSM is the SFPUC's operation planning model that simulates system operation over an 82-year span of differing hydrology, capturing the affects of within-year inflow regulation and year to year water supply objectives. The model simulates system operations on a monthly time step.

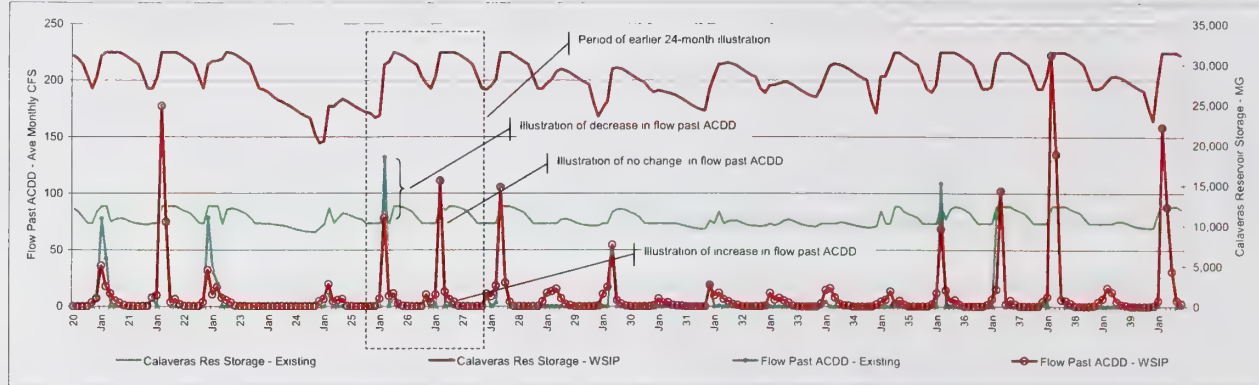
Figure 3-1 illustrates the sequential monthly operation of Calaveras Reservoir storage and the resultant flow past ACDD for both the existing and WSIP settings. The flow past ACDD is partially the result of Calaveras Reservoir using the diversion from ACDD for reservoir replenishment or supply for SVWTP, or Calaveras Reservoir rejecting diversions from ACDD due to the state of reservoir storage (i.e., being full). Shown in the illustration are the 24-month period of example previously discussed and the entire 82-years of simulation that assumed the recurrence of historical hydrology.

Concerning flows below ACDD, periods of reduction and increases are anticipated to occur. As described previously, reductions will occur when under the WSIP operation greater storage replenishment is needed. This circumstance can occur subsequent to multi-year drought or can occur within any year depending on several factors including system delivery needs from local reservoir storage (creating the need for replenishment) and the amount of runoff that occurs from Arroyo Hondo (negating the need for the ACDD diversion). Increases in flow below ACDD will occur due to the commitment to provide flow for the MOU flow objective first from bypassed inflow at ACDD. This action will decrease the amount of flow that would otherwise be diverted to Calaveras Reservoir.

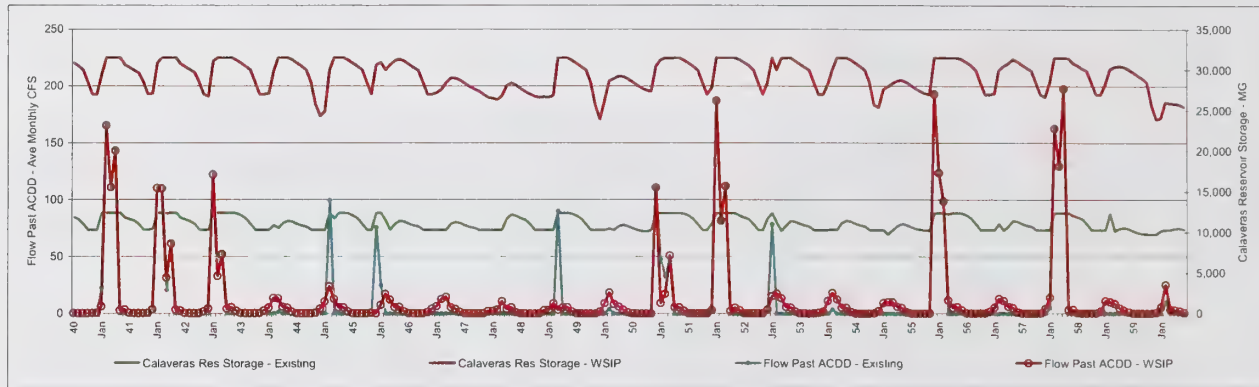
Table 3-1 provides an additional illustration of the frequency of the difference in flow that is anticipated with the WSIP operation. Table 3-1a shows the monthly-average flow past ACDD under the WSIP operation. Highlighted with shading are the months when flow is explicitly bypassed as a contribution towards compliance to MOU flow objectives. This release in combination with unregulated flow below the ACDD, if any, and supplemental releases from Calaveras Dam if needed, will provide compliance to the MOU flow objectives. Periods that do not have shading indicate either no inflow exists at ACDD (therefore no release), or compliance of the MOU flow objectives would be met with unregulated flow below ACDD and spills from ACDD and Calaveras Reservoir. The underlying values shown in the table are the average monthly flow that would occur past ACDD. Circled values indicate months when the flow past ACDD is anticipated to be reduced due to the change in operations at Calaveras Reservoir.

Figure 3-1
Calaveras Reservoir Storage and Flow Past ACDD

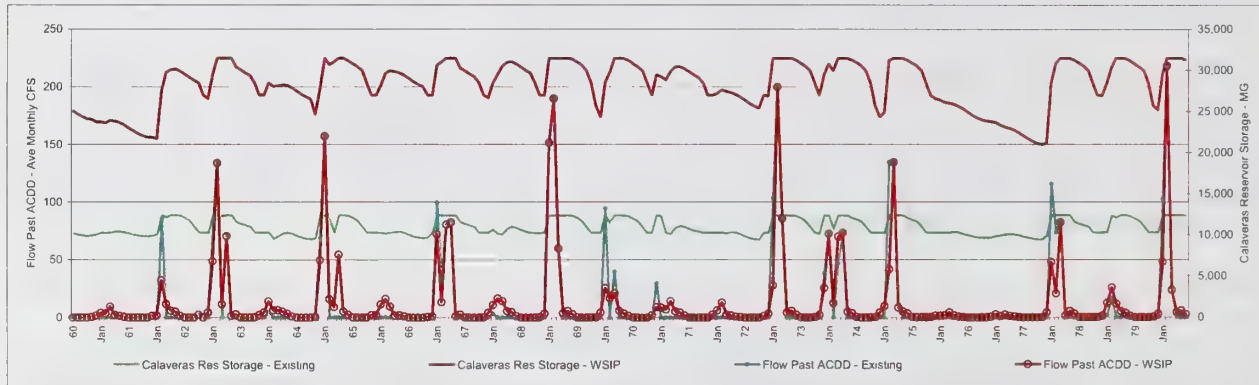
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

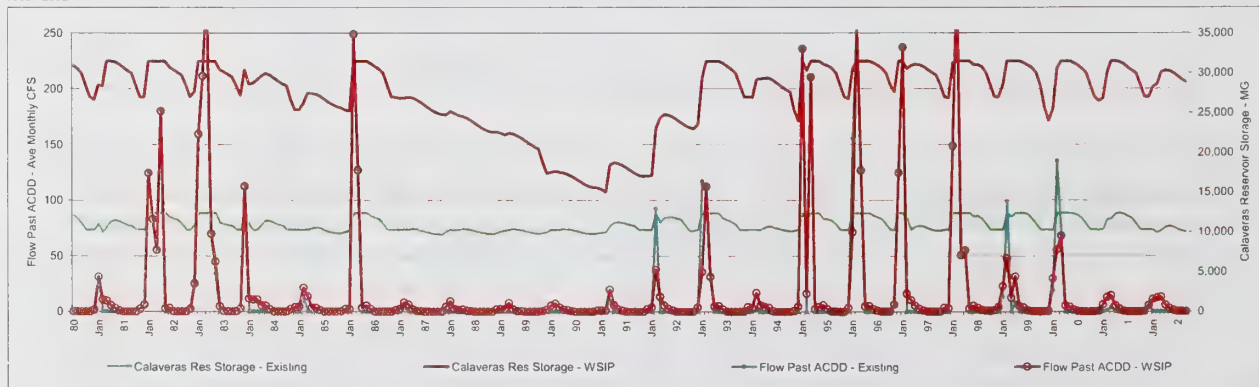


Table 3-1a
Flow Past ACDD under WSIP Operation – Average Monthly CFS

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	3	7	36	18	11	5	3	1	0	0	0
1922	0	0	8	10	177	75	4	6	2	0	0	0
1923	0	4	32	10	17	8	6	3	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	4	6	20	4	5	6	0	0	0	0
1926	0	0	0	7	78	9	11	2	0	0	0	0
1927	0	10	4	10	111	13	6	4	0	0	0	0
1928	0	0	11	9	18	106	21	4	0	0	0	0
1929	0	0	4	12	13	16	7	2	1	0	0	0
1930	0	0	1	11	17	55	5	2	1	0	0	0
1931	0	0	1	7	3	4	1	1	1	0	0	0
1932	0	0	19	10	12	6	5	2	1	0	0	0
1933	0	0	1	12	6	8	5	3	1	0	0	0
1934	0	0	3	15	16	8	2	1	1	0	0	0
1935	0	0	2	5	6	14	2	5	2	0	0	0
1936	0	0	2	12	69	14	4	6	2	0	0	0
1937	0	0	1	7	15	102	2	5	2	0	0	0
1938	0	0	4	8	223	135	6	5	3	0	0	0
1939	0	1	4	7	16	13	4	2	1	0	0	0
1940	0	0	1	5	159	88	31	5	2	0	0	0
1941	0	0	1	6	165	111	143	3	3	0	0	0
1942	0	0	3	110	110	31	61	3	3	0	0	0
1943	0	2	4	122	33	52	4	6	2	0	0	0
1944	0	0	3	5	14	13	6	5	1	0	0	0
1945	0	0	4	10	24	13	5	5	2	0	0	0
1946	0	1	0	7	17	12	5	6	2	0	0	0
1947	0	1	4	6	13	15	5	4	1	0	0	0
1948	0	0	2	2	3	11	4	5	1	0	0	0
1949	0	0	3	3	9	3	5	6	2	0	0	0
1950	0	0	2	9	18	8	5	3	1	0	0	0
1951	0	0	111	9	17	51	6	6	3	0	0	0
1952	0	0	3	187	82	112	2	5	3	0	0	0
1953	0	0	3	15	18	13	6	5	2	0	0	0
1954	0	1	2	11	18	13	5	5	2	0	0	0
1955	0	0	2	9	10	10	6	5	1	0	0	0
1956	0	0	193	124	99	12	5	6	3	0	0	0
1957	0	0	2	5	13	11	6	5	1	0	0	0
1958	0	0	4	14	163	130	198	3	4	0	0	0
1959	0	0	2	11	10	9	5	3	1	0	0	0
1960	0	0	1	6	25	4	3	2	1	0	0	0
1961	0	0	2	4	3	10	2	2	1	0	0	0
1962	0	0	1	2	32	12	6	5	1	0	0	0
1963	2	0	4	49	134	12	71	1	3	0	0	0
1964	0	2	5	14	6	6	5	3	1	0	0	0
1965	0	1	50	157	16	9	55	5	3	0	0	0
1966	0	2	2	11	16	10	2	2	1	0	0	0
1967	0	0	1	72	13	81	83	1	3	0	0	0
1968	0	0	4	11	17	14	6	5	1	0	0	0
1969	0	0	3	152	190	60	4	6	3	0	0	0
1970	0	0	4	26	17	21	6	4	2	0	0	0
1971	0	2	9	9	7	14	5	5	2	0	0	0
1972	0	0	3	6	13	3	2	1	1	0	0	0
1973	0	1	3	28	200	86	4	6	3	0	0	0
1974	0	2	26	73	13	70	73	5	4	0	0	0
1975	0	0	4	10	42	135	9	5	3	0	0	0
1976	0	0	2	2	2	4	2	1	0	0	0	0
1977	0	0	1	3	1	2	1	1	0	0	0	0
1978	0	0	4	48	21	83	1	5	3	0	0	0
1979	0	0	1	13	26	12	5	4	1	0	0	0
1980	0	0	3	48	218	24	4	6	3	0	0	0
1981	0	0	2	31	11	10	6	3	1	0	0	0
1982	0	3	6	125	83	56	180	3	3	0	0	0
1983	0	3	25	160	212	294	70	45	5	0	0	0
1984	0	3	113	12	11	11	6	6	2	0	0	0
1985	0	3	4	5	22	14	4	3	2	0	0	0
1986	0	0	2	2	249	127	3	6	3	0	0	0
1987	0	0	1	2	8	7	2	1	1	0	0	0
1988	0	0	4	9	2	2	2	1	0	0	0	0
1989	0	0	2	2	2	8	2	1	0	0	0	0
1990	0	1	2	6	7	4	2	1	1	0	0	0
1991	0	0	1	1	1	20	6	2	1	0	0	0
1992	0	0	3	4	38	14	6	3	1	0	0	0
1993	0	0	4	36	113	32	5	5	2	0	0	0
1994	0	0	4	3	17	6	4	4	1	0	0	0
1995	0	1	5	236	16	211	3	5	6	3	1	0
1996	0	0	4	72	259	127	5	5	3	1	0	0
1997	0	7	125	237	16	11	6	3	1	1	0	0
1998	0	4	3	149	306	51	55	3	5	4	2	1
1999	1	1	4	23	48	13	32	5	4	1	1	0
2000	0	1	1	30	56	68	6	5	2	1	0	0
2001	0	0	1	6	13	15	6	3	1	0	0	0
2002	0	1	6	11	12	13	6	3	1	0	0	0

Key

Periods when MOU release is being made

Periods of less flow past ACDD compared to existing setting

Table 3-1a illustrates that with a WSIP configuration that includes a year-round MOU flow objective and a commitment to pass inflow at ACDD to comply with those flow objectives, flow will explicitly be passed (if inflow occurs to ACDD) that would otherwise not be passed under existing operations. The indication that flow would occur during the summer should not be overstated due to the fact that inflow to ACDD can disappear entirely during the summer. However, the intended operation of the bypass under a WSIP operation would provide passage of the inflow if it did occur. Table 3-1b provides additional information regarding the frequency and magnitude of average monthly flow change below ACDD due to the WSIP operation.

Review of these two tables provides the following insights concerning the comparison of the WSIP operation to the existing operation:

- In every year, the implementation of the MOU with a flow commitment from ACDD inflow will result in more months having flow below ACDD.
- During 31 years out of the 82-years (38 percent of the years) of simulation at least one month of changed operation at Calaveras Reservoir will lead to a reduction in flow past ACDD.
- Within these 31 years of at least one month of reduction, during 18 years (e.g., 1937) there was at least one preceding or following month within the year during which no change occurred and significant flow passed ACDD unaffected by ACDD diversions to Calaveras Reservoir.

Additional information is developed by review of Table 3-1c, that illustrates the same data as Table 3-1b in a ranked order of descending annual inflow to Calaveras Reservoir (i.e., wettest year to driest year). This display of results shows that it is during normal and wetter years that a change in the ACDD diversion operation (that is going from a rejection operation to a diversion operation) is most likely to occur. Caution is advised developing generalized conclusions concerning the “type” of year that changes in flow occur. As discussed earlier several factors affect the changed operation of Calaveras Reservoir, some of which are not directly related to wetness of the basin in any one single year. The information in Table 3-1c is mostly an indication that there is a coincidence of available inflow from ACDD at times when Calaveras Reservoir needs greater replenishment in the WSIP operation. Also, the absence of a “negative” flow value in the table (shown year-round during drier years) does not mean that diversions to Calaveras Reservoir are not occurring. There will be times when there will be greater flow past ACDD than in the existing operation and still be diversions to Calaveras Reservoir – the circumstance is less water will be diverted to Calaveras Reservoir.

Conclusions can be developed from annual average and monthly average by year type summaries of the results. Table 3-2 (Table 3-2a presents units of average monthly cfs, and Table 3-2b presents units of monthly acre-feet) illustrates the average monthly by year-type results for flow passed at ACDD. The results vary by month and year type, with an overall average annual increase in release of about 650 acre-feet per year.

Results are also derived from HH/LSM simulations to illustrate flow immediately below Calaveras Dam. The interdependence of the Calaveras Reservoir operating range and releases from Calaveras Reservoir to Calaveras Creek (spill) is similar to the affect of the operating range upon rejection of diversions from ACDD to Calaveras Reservoir. If there is no, or limited available storage space in Calaveras Reservoir to regulate inflows with releases to SVWTP, diversions from ACDD will be rejected and excess inflow from Arroyo Hondo will be passed through Calaveras Reservoir to Calaveras Creek. Also, although the MOU flow objective at the confluence will be first met with available inflow occurring at ACDD, when available inflow is insufficient, the releases from ACDD will be supplemented by explicit releases from Calaveras Dam. This supplemental flow will particularly occur during the summer when inflow at ACDD is negligible.

Figure 3-2 illustrates the sequential monthly operation of Calaveras Reservoir storage and the resultant flow to Calaveras Creek for both the existing and WSIP settings. The noticeable difference in releases to the stream from Calaveras Dam is the supplement of flow when compliance to MOU flow objectives calls for releases from Calaveras Dam, and the reduction in passage of occasional storm inflows. Shown in the illustration are the 24-month period of example previously discussed and the entire 82-years of simulation that assumed the recurrence of historical hydrology.

Table 3-1b

Difference in Flow below ACDD, Comparison of WSIP and Existing Operation – Average Monthly CFS

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	3	0	-42	-24	11	5	3	1	0	0	0
1922	0	0	0	10	0	0	4	6	2	0	0	0
1923	0	4	-18	-21	-3	8	6	3	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	4	6	10	4	5	6	0	0	0	0
1926	0	0	0	7	-54	9	3	2	0	0	0	0
1927	0	4	4	10	0	13	5	4	0	0	0	0
1928	0	0	3	9	15	0	-3	4	0	0	0	0
1929	0	0	4	12	13	16	7	2	1	0	0	0
1930	0	0	1	11	17	7	5	2	1	0	0	0
1931	0	0	1	7	3	4	1	1	1	0	0	0
1932	0	0	0	10	11	6	5	2	1	0	0	0
1933	0	0	1	12	6	8	5	3	1	0	0	0
1934	0	0	3	10	16	8	2	1	1	0	0	0
1935	0	0	2	5	6	14	0	5	2	0	0	0
1936	0	0	2	12	-40	14	4	6	2	0	0	0
1937	0	0	1	7	-65	0	2	5	2	0	0	0
1938	0	0	0	8	0	0	-3	5	3	0	0	0
1939	0	1	4	7	16	13	4	2	1	0	0	0
1940	0	0	1	5	0	0	-3	5	2	0	0	0
1941	0	0	1	-16	0	0	0	3	3	0	0	0
1942	0	0	0	0	0	11	0	3	3	0	0	0
1943	0	2	4	0	17	0	4	6	2	0	0	0
1944	0	0	3	5	14	12	6	5	1	0	0	0
1945	0	0	4	10	-75	13	5	5	2	0	0	0
1946	0	1	-76	-17	17	12	5	6	2	0	0	0
1947	0	1	4	6	13	15	5	4	1	0	0	0
1948	0	0	2	2	3	11	4	5	1	0	0	0
1949	0	0	3	3	9	-87	5	6	2	0	0	0
1950	0	0	2	9	14	8	6	3	1	0	0	0
1951	0	0	0	-39	-15	5	6	6	3	0	0	0
1952	0	0	0	0	0	0	2	5	3	0	0	0
1953	0	0	0	-63	18	13	6	5	2	0	0	0
1954	0	1	2	11	15	13	5	5	2	0	0	0
1955	0	0	2	9	10	10	6	5	1	0	0	0
1956	0	0	0	0	0	12	5	6	3	0	0	0
1957	0	0	2	5	13	11	6	5	1	0	0	0
1958	0	0	4	9	0	0	0	3	4	0	0	0
1959	0	0	2	11	10	9	5	3	1	0	0	0
1960	0	0	1	6	15	4	3	2	1	0	0	0
1961	0	0	2	4	3	10	2	2	1	0	0	0
1962	0	0	1	2	-51	12	6	5	1	0	0	0
1963	0	0	4	-35	0	12	0	1	3	0	0	0
1964	0	2	5	9	6	6	5	3	1	0	0	0
1965	0	1	-19	0	16	9	55	5	3	0	0	0
1966	0	2	2	11	16	10	2	2	1	0	0	0
1967	0	0	1	-27	-20	0	0	1	3	0	0	0
1968	0	0	4	8	17	14	6	5	1	0	0	0
1969	0	0	3	0	0	0	4	6	3	0	0	0
1970	0	0	4	-69	17	-18	6	4	2	0	0	0
1971	0	2	-20	9	7	14	5	5	2	0	0	0
1972	0	0	3	6	13	3	2	1	1	0	0	0
1973	0	1	3	-76	0	0	4	6	3	0	0	0
1974	0	2	-13	0	13	23	0	5	4	0	0	0
1975	0	0	4	10	-93	0	-3	5	3	0	0	0
1976	0	0	2	2	2	0	2	1	0	0	0	0
1977	0	0	1	3	1	2	1	1	0	0	0	0
1978	0	0	4	-68	-53	0	1	5	3	0	0	0
1979	0	0	1	11	10	12	5	4	1	0	0	0
1980	0	0	3	-55	0	-2	4	6	3	0	0	0
1981	0	0	2	6	11	10	6	3	1	0	0	0
1982	0	3	2	0	0	0	0	3	3	0	0	0
1983	0	2	0	0	0	0	0	11	5	0	0	0
1984	0	1	0	12	11	11	6	6	2	0	0	0
1985	0	3	4	5	9	14	4	3	2	0	0	0
1986	0	0	2	2	0	0	3	6	3	0	0	0
1987	0	0	1	2	5	7	2	1	1	0	0	0
1988	0	0	4	9	2	2	2	1	0	0	0	0
1989	0	0	2	2	2	8	2	1	0	0	0	0
1990	0	1	2	6	7	4	2	1	1	0	0	0
1991	0	0	1	1	1	9	6	2	1	0	0	0
1992	0	0	3	4	-55	14	6	3	1	0	0	0
1993	0	0	4	-81	0	-2	5	5	2	0	0	0
1994	0	0	4	3	15	6	4	4	1	0	0	0
1995	0	1	5	0	16	0	2	5	6	3	1	0
1996	0	0	4	-84	0	0	5	5	3	1	0	0
1997	0	1	0	0	16	11	6	3	1	1	0	0
1998	0	4	3	0	0	0	0	3	5	4	2	1
1999	1	1	4	10	-51	13	23	5	4	1	1	0
2000	0	1	1	11	-79	0	6	4	2	1	0	0
2001	0	0	1	6	12	11	6	3	1	0	0	0
2002	0	1	1	11	12	13	6	3	1	0	0	0

Key

Reduction in flow

Table 3-1c

Difference in Flow below ACDD, Comparison of WSIP and Existing Operation – Average Monthly CFS
 Rank-ordered by Descending Annual Inflow to Calaveras Reservoir

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1983	0	2	0	0	0	0	0	11	5	0	0	0
1998	0	4	3	0	0	0	0	3	5	4	2	1
1958	0	0	4	9	0	0	0	3	4	0	0	0
1941	0	0	1	-16	0	0	0	3	3	0	0	0
1982	0	3	2	0	0	0	0	3	3	0	0	0
1995	0	1	5	0	16	0	2	5	6	3	1	0
1956	0	0	0	0	0	12	5	6	3	0	0	0
1952	0	0	0	0	0	0	2	5	3	0	0	0
1938	0	0	0	8	0	0	-3	5	3	0	0	0
1997	0	1	0	0	16	11	6	3	1	1	0	0
1969	0	0	3	0	0	0	4	6	3	0	0	0
1973	0	1	3	-76	0	0	4	6	3	0	0	0
1986	0	0	2	2	0	0	3	6	3	0	0	0
1980	0	0	3	-55	0	-2	4	6	3	0	0	0
1942	0	0	0	0	0	11	0	3	3	0	0	0
1967	0	0	1	-27	-20	0	0	1	3	0	0	0
1963	0	0	4	-35	0	12	0	1	3	0	0	0
1940	0	0	1	5	0	0	-3	5	2	0	0	0
1965	0	1	-19	0	16	9	55	5	3	0	0	0
1996	0	0	4	-84	0	0	5	5	3	1	0	0
1922	0	0	0	10	0	0	4	6	2	0	0	0
1975	0	0	4	10	-93	0	-3	5	3	0	0	0
1974	0	2	-13	0	13	23	0	5	4	0	0	0
1978	0	0	4	-68	-53	0	1	5	3	0	0	0
1993	0	0	4	-81	0	-2	5	5	2	0	0	0
1951	0	0	0	-39	-15	5	5	6	3	0	0	0
1943	0	2	4	0	-17	0	4	6	2	0	0	0
1927	0	4	4	10	0	13	5	4	0	0	0	0
1937	0	0	1	7	-65	0	2	5	2	0	0	0
2000	0	1	1	11	-79	0	6	4	2	1	0	0
1921	0	3	0	-42	-24	11	5	3	1	0	0	0
1999	1	1	4	10	-51	13	23	5	4	1	1	0
1923	0	4	-46	-21	-3	8	6	3	0	0	0	0
1953	0	0	0	-63	18	13	6	5	2	0	0	0
1928	0	0	3	9	15	0	-3	4	0	0	0	0
1970	0	0	4	-69	17	-18	6	4	2	0	0	0
1984	0	1	0	12	11	11	6	6	2	0	0	0
1946	0	1	-76	-17	17	12	5	6	2	0	0	0
1926	0	0	0	7	-54	9	3	2	0	0	0	0
1936	0	0	2	12	-40	14	4	6	2	0	0	0
1945	0	0	4	10	-75	13	5	5	2	0	0	0
1971	0	2	-20	9	7	14	5	5	2	0	0	0
1935	0	0	2	5	6	14	0	5	2	0	0	0
1932	0	0	0	10	11	6	5	2	1	0	0	0
1979	0	0	1	11	10	12	5	4	1	0	0	0
1962	0	0	1	2	-53	12	6	5	1	0	0	0
1949	0	0	3	3	9	-87	5	6	2	0	0	0
1992	0	0	3	4	-55	14	6	3	1	0	0	0
1981	0	0	2	6	11	10	6	3	1	0	0	0
2001	0	0	1	6	12	11	6	3	1	0	0	0
1930	0	0	1	11	17	7	5	2	1	0	0	0
1954	0	1	2	11	15	13	5	5	2	0	0	0
1968	0	0	4	8	17	14	6	5	1	0	0	0
1959	0	0	2	11	10	9	5	3	1	0	0	0
1925	0	0	4	6	10	4	5	6	0	0	0	0
1944	0	0	3	5	14	12	6	5	1	0	0	0
2002	0	1	1	11	12	13	6	3	1	0	0	0
1950	0	0	2	9	14	8	6	3	1	0	0	0
1966	0	2	2	11	16	10	2	2	1	0	0	0
1955	0	0	2	9	10	10	6	5	1	0	0	0
1957	0	0	2	5	13	11	6	5	1	0	0	0
1934	0	0	3	10	16	8	2	1	1	0	0	0
1985	0	3	4	5	9	14	4	3	2	0	0	0
1991	0	0	1	1	1	9	6	2	1	0	0	0
1929	0	0	4	12	13	16	7	2	1	0	0	0
1964	0	2	5	9	6	6	5	3	1	0	0	0
1947	0	1	4	6	13	15	5	4	1	0	0	0
1994	0	0	4	3	15	6	4	4	1	0	0	0
1939	0	1	4	7	16	13	4	2	1	0	0	0
1948	0	0	2	2	3	11	4	5	1	0	0	0
1960	0	0	1	6	15	4	3	2	1	0	0	0
1972	0	0	3	6	13	3	2	1	1	0	0	0
1933	0	0	1	12	6	8	5	3	1	0	0	0
1961	0	0	2	4	3	10	2	2	1	0	0	0
1990	0	1	2	6	7	4	2	1	1	0	0	0
1987	0	0	1	2	5	7	2	1	1	0	0	0
1988	0	0	4	9	2	2	2	1	0	0	0	0
1989	0	0	2	2	2	8	2	1	0	0	0	0
1931	0	0	1	7	3	4	1	1	1	0	0	0
1976	0	0	2	2	2	4	2	1	0	0	0	0
1977	0	0	1	3	1	2	1	1	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0

Key

Reduction in flow

Table 3-2a
ACDD Release to Alameda Creek

Flow past ACDD - Average Monthly CFS (Average within Year Type - Grouped by 5 Local Reservoir Runoff)												WSIP
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	1	24	104	147	96	52	7	3	1	0	0
Above Norr	0	1	16	42	73	56	19	5	2	0	0	0
Normal	0	0	11	11	25	18	7	4	1	0	0	0
Below Norr	0	1	3	9	14	14	5	4	1	0	0	0
Dry	0	0	2	5	8	6	3	2	1	0	0	0
All Years	0	1	11	34	53	38	17	4	2	0	0	0

Flow Past ACDD - Average Monthly CFS (Average within Year Type - Grouped by 5 Local Reservoir Runoff)												Existing
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	22	113	146	94	50	2	0	0	0	0
Above Norr	0	0	18	60	95	50	12	0	0	0	0	0
Normal	0	0	16	14	34	15	2	0	0	0	0	0
Below Norr	0	0	0	1	2	4	0	0	0	0	0	0
Dry	0	0	0	0	1	0	0	0	0	0	0	0
All Years	0	0	11	37	55	32	13	0	0	0	0	0

Difference in Flow past ACDD - Average Monthly CFS (Average within Year Type - Grouped by 5 Local Reservoir Runoff)												WSIP minus Existing
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	1	2	-10	1	2	2	5	3	1	0	0
Above Norr	0	1	-2	-18	-22	5	7	5	2	0	0	0
Normal	0	0	-4	-3	-9	3	4	4	1	0	0	0
Below Norr	0	1	2	8	12	10	5	4	1	0	0	0
Dry	0	0	2	5	7	6	3	2	1	0	0	0
All Years	0	1	0	-4	-2	5	4	4	2	0	0	0

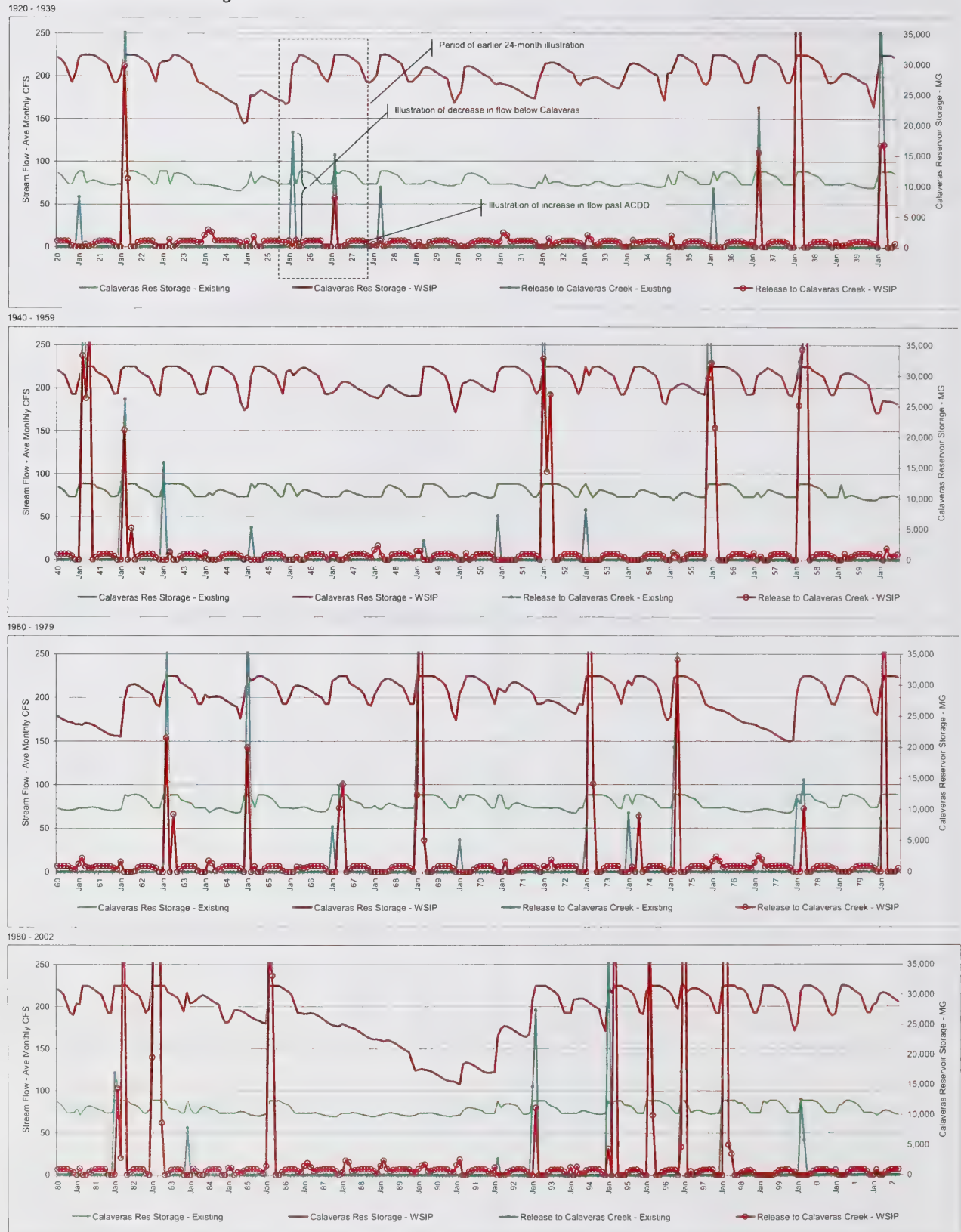
Table 3-2b
ACDD Release to Alameda Creek

Flow past ACDD - Acre-feet												WSIP	
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	7	77	1,488	6,376	8,142	5,878	3,078	415	198	42	18	12	25,731
Above Norr	18	87	973	2,559	4,077	3,429	1,116	295	139	23	11	7	12,734
Normal	7	29	687	669	1,364	1,092	391	270	87	8	5	3	4,611
Below Norr	7	36	168	561	778	862	308	216	64	6	4	3	3,013
Dry	7	16	131	300	432	377	162	114	38	3	3	2	1,585
All Years	9	49	686	2,080	2,945	2,323	1,004	262	105	17	8	5	9,494

Flow Past ACDD - Acre-feet												Existing	
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,967	8,098	5,757	2,972	130	0	0	0	0	25,331
Above Norr	7	23	1,126	3,672	5,294	3,096	692	0	0	0	0	0	13,911
Normal	0	6	954	868	1,870	906	126	0	0	0	0	0	4,731
Below Norr	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	57
All Years	1	12	692	2,299	3,075	1,989	748	26	0	0	0	0	8,842

Difference in Flow past ACDD - Acre-feet												WSIP minus Existing	
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	7	49	109	-591	43	121	107	285	198	42	18	12	400
Above Norr	11	64	-153	-1,113	-1,217	333	424	295	139	23	11	7	-1,177
Normal	7	23	-268	-200	-506	187	264	270	87	8	5	3	-120
Below Norr	7	36	151	516	676	633	308	216	64	6	4	3	2,619
Dry	7	16	131	300	375	377	162	114	38	3	3	2	1,527
All Years	8	38	-6	-219	-129	334	256	236	105	17	8	5	652

Figure 3-2
Calaveras Reservoir Storage and Release to Calaveras Creek



As described earlier, the restoration of the operating range at Calaveras Reservoir will develop a greater within-year or year to year need for reservoir replenishment. For the February 1926 example, the replenishment need of Calaveras Reservoir during this month absorbed the total amount inflow from Arroyo Hondo, which in the existing operation needed to be partially released to Calaveras Creek in order to not exceed the DSOD storage level objective. Table 3-3a illustrates the frequency and magnitude of releases from Calaveras Dam to Calaveras Creek under the WSIP operation.

The results show that during all summers and falls supplemental releases for the MOU will be made from Calaveras Reservoir, flows that do not occur under existing operations. Supplemental releases for from Calaveras Reservoir for MOU compliance diminish during the winter and spring as unregulated flow below ACDD and the passing of inflow at ACDD will typically satisfy the MOU flow objectives at the confluence. Circled values in Table 3-3a indicate months in which the release from Calaveras Reservoir to Calaveras Creek will be diminished (if not eliminated) under the WSIP operation. The diminishment of flow occurs during periods when under the existing operation limited storage space in Calaveras Reservoir required the passage of Arroyo Hondo inflow (spills). Table 3-3b provides additional information regarding the change in flows below Calaveras Dam, both reductions in flow due to reservoir replenishment and increases in flow due to MOU releases.

With the ability to make valve releases from Calaveras Reservoir prior to maximum storage pool, in either operation the releases to Calaveras Creek would be generally “constant” without significant fluctuation for days or weeks in duration.

Table 3-4a and Table 3-4b provide annual average and monthly average by year type summaries of the results. Table 3-4a presents units of average monthly cfs, and Table 3-4b presents units of acre-feet illustrating the average monthly by year-type results for flow released from Calaveras Dam. The results vary by month and year type, with a trend to reduce flows during winter months of wetter years for reservoir replenishment and an increase in flows in all other months for MOU purposes. The overall change in average annual release for the 82-year simulation period is negligible.

Flow at the confluence will change between the two settings, both in monthly distribution and in annual occurrence. The flow at the confluence is affected by the SFPUC’s operations at ACDD and Calaveras Dam as described previously, and the occurrence of unregulated runoff from the watersheds below the dam structures.

Shown in the following table for information, the unregulated watershed below the dam structures is estimated to produce an average annual 1,900 acre-feet of flow, varying greatly between years dependent upon rainfall events. Although modeled as a monthly average quantity, the hydrograph of the runoff has typical rising and falling limbs varying instantaneously throughout a day depending on the magnitude and temporal distribution of rainfall.

Unregulated Flow between ACDD and Calaveras Confluence - Average Monthly CFS												
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	1	6	16	21	16	10	3	1	0	0	0
Above Norr	0	1	4	10	14	9	5	2	0	0	0	0
Normal	0	0	4	4	7	5	3	1	0	0	0	0
Below Norr	0	0	1	2	4	4	1	1	0	0	0	0
Dry	0	0	0	1	1	1	1	0	0	0	0	0
All Years	0	0	3	7	10	7	4	1	0	0	0	0

Unregulated Flow between ACDD and Calaveras Confluence - Acre-feet													
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	52	344	1,009	1,188	986	602	177	31	12	5	2	4,409
Above Norr	5	45	244	598	776	561	311	103	21	6	2	1	2,673
Normal	1	22	226	269	386	327	158	60	10	2	0	0	1,461
Below Norr	1	22	61	141	235	221	72	41	7	0	0	0	801
Dry	1	6	26	35	67	70	43	23	2	0	0	0	272
All Years	2	30	179	409	530	432	236	80	14	4	1	1	1,919

This unregulated runoff begins to add flow to the stream reaches immediately below the dam structures, the amount added at any point in the stream reach in proportion to the watershed area added to the stream at that point.

Table 3-3a

Calaveras Dam Releases to Calaveras Creek – WSIP Operation

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	7	2	0	0	0	3	1	3	6	7	7	7
1922	7	5	0	0	212	80	0	0	5	7	7	7
1923	7	1	0	0	0	9	0	3	7	7	7	7
1924	7	5	5	14	20	17	7	7	7	7	7	7
1925	7	5	0	0	0	12	0	0	7	7	7	7
1926	7	5	5	7	0	8	0	5	7	7	7	7
1927	7	0	0	0	57	0	0	1	6	7	7	7
1928	7	5	0	3	2	6	0	3	7	7	7	7
1929	7	5	0	1	5	0	0	5	6	7	7	7
1930	7	5	4	0	1	0	1	4	6	7	7	7
1931	7	5	4	6	16	13	6	6	6	7	7	7
1932	7	5	0	0	0	10	2	4	6	7	7	7
1933	7	5	4	0	13	8	1	3	6	7	7	7
1934	7	5	0	0	0	8	4	6	6	7	7	7
1935	7	5	3	0	13	0	0	0	5	7	7	7
1936	7	5	3	0	0	0	0	0	5	7	7	7
1937	7	5	3	6	0	110	0	0	5	7	7	7
1938	7	5	0	0	358	260	0	0	4	7	7	7
1939	7	4	0	6	2	2	2	5	6	7	7	7
1940	7	5	4	0	119	120	0	0	4	7	7	7
1941	7	5	0	0	238	188	283	0	3	6	7	7
1942	7	4	0	0	151	0	37	0	4	7	7	7
1943	7	2	0	0	0	9	0	0	4	7	7	7
1944	7	5	2	8	0	0	0	1	5	7	7	7
1945	7	4	0	2	0	0	0	0	5	7	7	7
1946	7	4	0	0	0	3	0	0	5	7	7	7
1947	7	3	0	7	6	0	0	2	6	7	7	7
1948	7	5	3	11	16	4	0	0	6	7	7	7
1949	7	5	2	10	10	0	0	0	5	7	7	7
1950	7	5	3	0	0	7	0	3	6	7	7	7
1951	7	0	0	0	0	0	0	0	4	7	7	7
1952	7	5	0	234	103	192	0	0	4	7	7	7
1953	7	5	0	0	0	0	0	0	5	7	7	7
1954	7	4	3	0	0	0	0	1	5	7	7	7
1955	7	5	0	0	9	6	0	1	6	7	7	7
1956	7	5	212	229	154	0	0	0	4	7	7	7
1957	7	5	3	8	0	4	0	0	6	7	7	7
1958	7	5	0	0	180	245	446	0	3	6	7	7
1959	7	5	3	0	0	7	2	4	7	7	7	7
1960	7	5	4	7	0	13	4	4	6	7	7	7
1961	7	4	3	9	16	6	5	5	6	7	7	7
1962	7	5	3	12	0	0	0	1	5	7	7	7
1963	6	5	0	0	154	0	66	0	4	7	7	7
1964	7	1	0	0	13	10	1	3	6	7	7	7
1965	7	4	0	143	0	7	0	0	4	7	7	7
1966	7	1	0	0	0	6	5	5	6	7	7	7
1967	7	4	0	0	0	73	101	0	4	7	7	7
1968	7	5	0	0	0	0	0	1	6	7	7	7
1969	7	5	0	88	426	36	0	0	3	7	7	7
1970	7	5	0	0	0	0	0	3	5	7	7	7
1971	7	1	0	0	12	0	0	2	5	7	7	7
1972	7	5	0	7	5	14	5	6	6	7	7	7
1973	7	0	0	0	428	101	0	0	4	7	7	7
1974	7	0	0	0	6	0	64	0	3	6	7	7
1975	7	4	0	3	0	243	0	0	3	6	7	7
1976	7	4	3	12	18	12	5	6	7	7	7	7
1977	7	5	4	11	19	15	6	6	7	7	7	7
1978	7	5	0	0	0	72	0	0	3	7	7	7
1979	7	5	4	0	0	0	0	3	6	7	7	7
1980	7	4	0	0	403	0	0	0	4	7	7	7
1981	7	5	3	0	8	0	0	3	6	7	7	7
1982	7	0	0	1	103	20	384	0	3	7	7	7
1983	7	2	0	140	486	728	62	0	1	6	7	7
1984	6	0	0	0	8	4	0	0	5	7	7	7
1985	7	0	0	9	9	0	3	3	5	7	7	7
1986	7	5	2	11	259	237	0	0	4	7	7	7
1987	7	5	3	11	15	10	5	6	6	7	7	7
1988	7	5	0	3	17	16	5	6	7	7	7	7
1989	7	5	3	11	17	8	5	6	7	7	7	7
1990	7	4	3	7	12	13	5	5	6	7	7	7
1991	7	5	4	13	19	0	0	4	6	7	7	7
1992	7	5	2	9	0	0	0	4	5	7	7	7
1993	7	5	0	0	80	0	0	0	4	7	7	7
1994	7	5	0	10	0	10	2	2	6	7	7	7
1995	7	4	0	31	0	417	0	0	0	4	6	7
1996	7	5	0	0	305	71	0	0	4	6	6	7
1997	7	0	34	561	0	5	1	4	6	6	7	7
1998	7	1	0	0	895	36	25	0	0	3	5	6
1999	6	3	0	0	0	0	0	0	2	6	6	7
2000	7	4	4	0	0	0	0	2	5	6	7	7
2001	7	5	4	6	0	0	0	4	6	7	7	7
2002	7	4	0	0	6	0	0	3	6	7	7	7

Key

Periods when MOU release is being made

Periods of less flow to Creek compared to existing setting

Table 3-3b

Difference in Flow below Calaveras Dam, Comparison of WSIP and Existing Operation – Average Monthly CFS

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	7	2	0	-58	0	3	1	3	6	7	7	7
1922	7	5	0	0	-62	-2	0	0	5	7	7	7
1923	7	1	0	0	0	9	0	3	7	7	7	7
1924	7	5	5	14	20	17	7	7	7	7	7	7
1925	7	5	0	7	0	12	0	0	7	7	7	7
1926	7	5	5	7	-134	8	0	5	7	7	7	7
1927	7	0	0	0	-51	0	0	1	6	7	7	7
1928	7	5	0	3	2	-63	0	3	7	7	7	7
1929	7	5	0	1	5	0	0	5	6	7	7	7
1930	7	5	4	0	1	0	1	4	6	7	7	7
1931	7	5	4	6	16	13	6	6	6	7	7	7
1932	7	5	0	0	0	10	2	4	6	7	7	7
1933	7	5	4	0	13	8	1	3	6	7	7	7
1934	7	5	0	0	0	8	4	6	6	7	7	7
1935	7	5	3	0	13	0	0	0	5	7	7	7
1936	7	5	3	0	-68	0	0	0	5	7	7	7
1937	7	5	3	6	0	-53	0	0	5	7	7	7
1938	7	5	0	0	-52	-2	0	0	4	7	7	7
1939	7	4	0	6	2	-2	2	5	6	7	7	7
1940	7	5	4	0	-175	-2	0	0	4	7	7	7
1941	7	5	0	0	-116	-2	-3	0	3	6	7	7
1942	7	4	0	-90	-36	0	0	0	4	7	7	7
1943	7	2	0	-113	-6	-2	0	0	4	7	7	7
1944	7	5	2	8	0	0	0	1	5	7	7	7
1945	7	4	0	2	-37	0	0	0	5	7	7	7
1946	7	4	0	0	0	3	0	0	5	7	7	7
1947	7	3	0	7	6	0	0	2	6	7	7	7
1948	7	5	3	11	16	4	0	0	6	7	7	7
1949	7	5	2	10	10	-22	0	0	5	7	7	7
1950	7	5	3	0	0	7	0	3	6	7	7	7
1951	7	0	-51	0	0	0	0	0	4	7	7	7
1952	7	5	0	-121	-1	-2	0	0	4	7	7	7
1953	7	5	0	-58	0	0	0	0	5	7	7	7
1954	7	4	3	0	0	0	0	1	5	7	7	7
1955	7	5	0	0	9	6	0	1	6	7	7	7
1956	7	5	-118	-1	-1	0	0	0	4	7	7	7
1957	7	5	3	8	0	4	0	0	6	7	7	7
1958	7	5	0	0	-51	-2	-3	0	3	6	7	7
1959	7	5	3	0	0	7	2	4	6	7	7	7
1960	7	5	4	7	0	13	4	4	6	7	7	7
1961	7	4	3	9	16	6	5	5	6	7	7	7
1962	7	5	3	12	0	0	0	1	5	7	7	7
1963	6	5	0	-9	-105	0	2	0	4	7	7	7
1964	7	1	0	0	13	10	1	3	6	7	7	7
1965	7	4	0	-185	0	7	0	0	4	7	7	7
1966	7	1	0	0	0	6	5	5	6	7	7	7
1967	7	4	0	-62	0	-25	-3	0	4	7	7	7
1968	7	5	0	0	0	0	0	1	6	7	7	7
1969	7	5	0	-120	-1	-2	0	0	3	7	7	7
1970	7	5	0	-37	0	0	0	3	5	7	7	7
1971	7	1	0	0	12	0	0	2	5	7	7	7
1972	7	5	0	7	5	14	5	6	6	7	7	7
1973	7	0	0	-50	-1	-2	0	0	4	7	7	7
1974	7	0	0	-68	6	0	-3	0	3	6	7	7
1975	7	4	0	3	-143	-15	0	0	3	6	7	7
1976	7	4	3	12	18	12	5	6	7	7	7	7
1977	7	5	4	11	19	15	6	6	7	7	7	7
1978	7	5	0	-83	-79	-33	0	0	3	7	7	7
1979	7	5	4	0	0	0	0	3	6	7	7	7
1980	7	4	0	-61	-108	0	0	0	4	7	7	7
1981	7	5	3	0	8	0	0	3	6	7	7	7
1982	7	0	0	-120	-1	-2	-3	0	3	7	7	7
1983	7	2	0	-121	-1	-2	-3	0	1	6	7	7
1984	6	0	-56	0	8	4	0	0	5	7	7	7
1985	7	0	0	9	9	0	3	3	5	7	7	7
1986	7	5	2	11	-225	-2	0	0	4	7	7	7
1987	7	5	3	11	15	10	5	6	6	7	7	7
1988	7	5	0	3	17	16	5	6	7	7	7	7
1989	7	5	3	11	17	8	5	6	7	7	7	7
1990	7	4	3	7	12	13	5	5	6	7	7	7
1991	7	5	4	13	19	0	0	4	6	7	7	7
1992	7	5	2	9	-20	0	0	4	5	7	7	7
1993	7	5	0	-106	-116	0	0	0	4	7	7	7
1994	7	5	0	10	0	10	2	2	6	7	7	7
1995	7	4	0	-271	0	-17	0	0	0	4	6	7
1996	7	5	0	0	-53	-2	0	0	4	6	6	7
1997	7	0	-89	-1	0	5	1	4	6	6	7	7
1998	7	1	0	-117	-12	-2	-3	0	0	3	5	6
1999	6	3	0	0	0	0	0	0	2	6	6	7
2000	7	4	4	0	-90	-41	0	2	5	6	7	7
2001	7	5	4	6	0	0	0	4	6	7	7	7
2002	7	4	0	0	6	0	0	3	5	7	7	7

Key

Reduction in flow

Table 3-4a

Calaveras Reservoir Release to Calaveras Creek

Total Stream Release from Calaveras Reservoir - Average Monthly CFS (Average within Year Type - Grouped by 5 Local Reservoir Runoff)												WSIP
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	7	3	15	81	261	159	84	0	3	6	7	7
Above Norr	7	3	1	9	55	43	8	1	4	7	7	7
Normal	7	4	2	3	3	2	0	2	5	7	7	7
Below Norr	7	4	2	3	4	4	1	3	6	7	7	7
Dry	7	5	2	8	12	10	4	5	6	7	7	7
All Years	7	4	4	20	66	43	19	2	5	7	7	7

Total Stream Release from Calaveras Reservoir - Average Monthly CFS (Average within Year Type - Grouped by 5 Local Reservoir Runoff)												Existing
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	28	151	299	162	84	0	0	0	0	0
Above Norr	0	0	3	45	107	50	8	0	0	0	0	0
Normal	0	0	4	6	16	6	0	0	0	0	0	0
Below Norr	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	7	40	84	43	18	0	0	0	0	0

Difference in Total Stream Release from Calaveras Reservoir - Average Monthly CFS (Average within Year Type - Grouped by 5 Local Reservoir Runoff)												WSIP minus Existing
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	7	3	-13	-70	-38	-3	-1	0	3	6	7	7
Above Norr	7	3	-2	-36	-52	-8	0	1	4	7	7	7
Normal	7	4	-2	-3	-13	-4	0	2	5	7	7	7
Below Norr	7	4	2	3	4	4	1	3	6	7	7	7
Dry	7	5	2	8	12	10	4	5	6	7	7	7
All Years	7	4	-3	-19	-18	0	1	2	5	7	7	7

Table 3-4b

Calaveras Reservoir Release to Calaveras Creek

Total Stream Release from Calaveras Reservoir - Acre-feet													WSIP	
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)													Sep	WY Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug			
Wet	423	196	951	4,980	14,517	9,759	4,978	14	187	376	407	403	37,191	
Above Norr	415	194	43	550	3,051	2,624	459	32	256	401	417	409	8,851	
Normal	423	252	93	166	183	120	7	100	320	420	426	413	2,924	
Below Norr	422	240	96	186	200	218	60	173	346	424	427	414	3,205	
Dry	423	276	151	508	669	624	235	294	377	427	428	414	4,826	
All Years	421	231	262	1,256	3,673	2,639	1,126	122	297	410	421	411	11,268	

Total Stream Release from Calaveras Reservoir - Acre-feet													Existing	
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)													Sep	WY Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug			
Wet	0	0	1,741	9,267	16,622	9,968	5,024	0	0	0	0	0	42,623	
Above Norr	0	0	184	2,766	5,917	3,096	459	0	0	0	0	0	12,423	
Normal	0	0	216	364	898	353	0	0	0	0	0	0	1,831	
Below Norr	0	0	0	0	0	0	0	0	0	0	0	0	0	
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0	
All Years	0	0	420	2,453	4,645	2,656	1,076	0	0	0	0	0	11,249	

Difference in Total Stream Release from Calaveras Reservoir - Acre-feet													WSIP minus Existing	
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)													Sep	WY Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug			
Wet	423	196	-790	-4,288	-2,105	-209	-46	14	187	376	407	403	-5,432	
Above Norr	415	194	-142	-2,215	-2,866	-472	-1	32	256	401	417	409	-3,572	
Normal	423	252	-123	-198	-715	-233	7	100	320	420	426	413	1,093	
Below Norr	422	240	96	186	200	218	60	173	346	424	427	414	3,205	
Dry	423	276	151	508	669	624	235	294	377	427	428	414	4,826	
All Years	421	231	-158	-1,197	-973	-17	51	122	297	410	421	411	19	

Figure 3-3 illustrates the simulated flow at the confluence under the existing and WSIP operations, and Table 3-5a illustrates the frequency and magnitude of flow at the confluence under the WSIP operation. Complementing that illustration is Table 3-5b that provides additional information regarding the change in flows at the confluence, the combined reductions in flow due to reservoir replenishment and the increases in flow due to MOU releases.

There are 984 months of this simulation (82 years, 12 months a year). There are 105 months (11 percent of the months) in which a reduction in average monthly flow occurs. These reductions can be the result of solely the reduced spills from Calaveras (about 60 percent of the months), solely the reduced spill from ACDD (about 23 percent of the months), or the combination of both (about 17 percent of the months). There are 8 months when no change in flow is simulated, and 871 months (88 percent) when flow volume increases. Table 3-6a and Table 3-6b provide annual average and monthly average by year type summaries of the results. Table 3-6a presents units of average monthly cfs, and Table 3-6b presents units of acre-feet illustrating the average monthly by year-type results for flow at the confluence. The results vary by month and year type, with a trend to reduce flows during winter months of wetter years for reservoir replenishment and an increase in flows in all other months for MOU purposes. The overall change in average annual release for the 82-year simulation period is an average annual increase in flow of about 670 acre-feet per year, primarily the result of increased releases from ACDD.

Downstream of the confluence, additional unregulated watershed runoff (including flow from Welch Creek and other creeks) will increase flows in Alameda Creek. The hydrograph of the unregulated runoff has typical rising and falling limbs varying instantaneously throughout a day depending on the magnitude and temporal distribution of rainfall. This unregulated runoff begins to add flow to the stream immediately below the confluence, with the amount of flow added at any point in the stream reach dependent upon the watershed area added to the stream at that point.

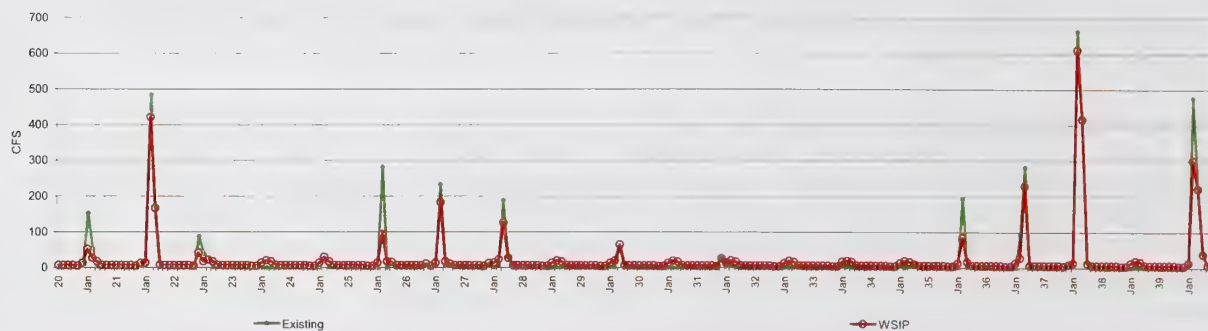
The MOU includes a component of flow recapture for the Regional Water System. The working assumption for water supply planning and, therefore, modeling purposes, is that the quantity of water recaptured is limited to the water explicitly released from ACDD and Calaveras Dam from MOU compliance. Further, it is assumed that the recapture facility will be sized no greater than 20 cfs. Unregulated watershed runoff contributing to MOU compliance is not recaptured. Table 3-7 illustrates the anticipated diversion of water at the recapture site, shown in combination with the coincidental periods of explicit releases for the MOU (recapture is shown as zero during months when no explicit release is made). Also shown Table 3-7 are months when flow at the confluence is anticipated to be reduced in the WSIP operation. The effect of the recapture operation is a reduction in the flow that occurs in Alameda Creek below the recapture facility, but that decrease is only to the extent that supplemental releases are explicitly made from ACDD and Calaveras Reservoir. During a majority of the months when flows at the confluence are anticipated to decrease, periods of higher flows in Alameda Creek, the flows in Alameda Creek are not diminished by the recapture operation under the WSIP operation. This circumstance occurs because during episodes of larger flows in Alameda Creek no explicit MOU releases are made; therefore no recapture occurs.

Table 3-8a and Table 3-8b provide annual average and monthly average by year type summaries of the results. Table 3-8a presents units of average month cfs, and Table 3-8b presents units of acre-feet illustrating the average monthly by year-type results for flow diverted by recapture. The overall amount of diversion at the recapture site for the 82-year simulation period is 4,960 acre-feet per year.

Figure 3-3
Flow at Confluence – Existing and WSIP Operations

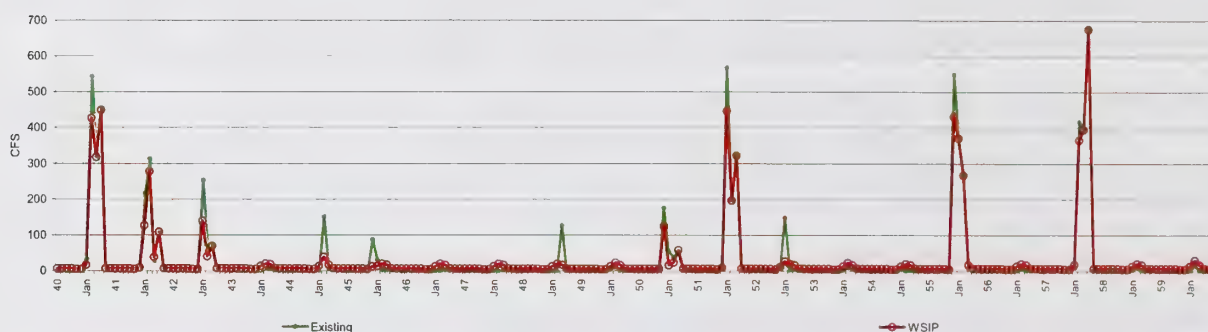
1920 - 1939

Flow below Alameda/Calaveras Creek Confluence - Average Monthly CFS



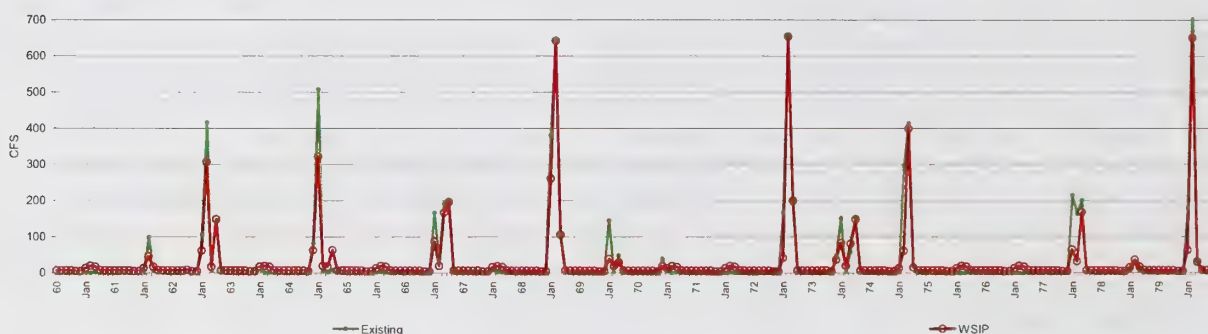
1940 - 1959

Flow below Alameda/Calaveras Creek Confluence - Average Monthly CFS



1960 - 1979

Flow below Alameda/Calaveras Creek Confluence - Average Monthly CFS



1980 - 2002

Flow below Alameda/Calaveras Creek Confluence - Average Monthly CFS

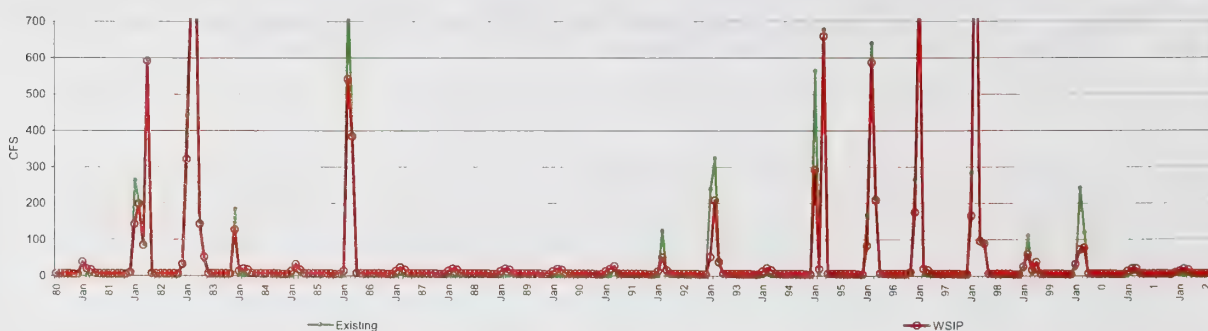


Table 3-5a

Flow at Confluence under WSIP Operation – Average Monthly CFS

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	7	5	13	52	27	17	7	7	7	7	7	7
1922	7	5	13	14	422	166	7	7	7	7	7	7
1923	7	5	41	17	22	17	7	7	7	7	7	7
1924	7	5	5	14	20	17	7	7	7	7	7	7
1925	7	5	5	14	30	17	7	7	7	7	7	7
1926	7	5	5	14	94	17	16	7	7	7	7	7
1927	7	12	5	14	183	17	11	7	7	7	7	7
1928	7	5	13	14	23	126	27	7	7	7	7	7
1929	7	5	5	14	20	17	7	7	7	7	7	7
1930	7	5	5	14	20	65	7	7	7	7	7	7
1931	7	5	5	14	20	17	7	7	7	7	7	7
1932	7	5	27	14	21	17	7	7	7	7	7	7
1933	7	5	5	14	20	17	7	7	7	7	7	7
1934	7	5	5	18	20	17	7	7	7	7	7	7
1935	7	5	5	14	20	17	11	7	7	7	7	7
1936	7	5	5	14	85	17	7	7	7	7	7	7
1937	7	5	5	14	28	229	7	7	7	7	7	7
1938	7	5	9	14	611	417	12	7	7	7	7	7
1939	7	5	5	14	20	17	7	7	7	7	7	7
1940	7	5	5	15	301	223	38	7	7	7	7	7
1941	7	5	5	17	427	317	449	7	7	7	7	7
1942	7	5	9	126	277	38	108	7	7	7	7	7
1943	7	5	5	140	40	70	7	7	7	7	7	7
1944	7	5	5	14	20	19	7	7	7	7	7	7
1945	7	5	5	14	39	17	7	7	7	7	7	7
1946	7	5	12	14	20	17	7	7	7	7	7	7
1947	7	5	5	14	20	17	7	7	7	7	7	7
1948	7	5	5	14	20	17	7	7	7	7	7	7
1949	7	5	5	14	20	18	7	7	7	7	7	7
1950	7	5	5	14	24	17	7	7	7	7	7	7
1951	7	7	126	16	24	59	7	7	7	7	7	7
1952	7	5	10	448	197	323	7	7	7	7	7	7
1953	7	5	12	28	20	17	7	7	7	7	7	7
1954	7	5	5	14	24	17	7	7	7	7	7	7
1955	7	5	5	14	20	17	7	7	7	7	7	7
1956	7	5	432	371	268	17	7	7	7	7	7	7
1957	7	5	5	14	20	17	7	7	7	7	7	7
1958	7	5	5	19	366	396	676	7	7	7	7	7
1959	7	5	5	14	20	17	7	7	7	7	7	7
1960	7	5	5	14	30	17	7	7	7	7	7	7
1961	7	5	5	14	20	17	7	7	7	7	7	7
1962	7	5	5	14	46	17	7	7	7	7	7	7
1963	9	5	5	62	308	17	149	7	7	7	7	7
1964	7	5	5	18	20	17	7	7	7	7	7	7
1965	7	5	63	323	20	17	64	7	7	7	7	7
1966	7	5	5	14	20	17	7	7	7	7	7	7
1967	7	5	5	87	20	167	197	7	7	7	7	7
1968	7	5	5	17	20	17	7	7	7	7	7	7
1969	7	5	5	262	643	106	7	7	7	7	7	7
1970	7	5	5	40	20	31	7	7	7	7	7	7
1971	7	5	20	14	20	17	7	7	7	7	7	7
1972	7	5	5	14	20	17	7	7	7	7	7	7
1973	7	6	5	43	655	200	7	7	7	7	7	7
1974	7	5	37	84	20	81	149	7	7	7	7	7
1975	7	5	5	14	61	400	15	7	7	7	7	7
1976	7	5	5	14	20	17	7	7	7	7	7	7
1977	7	5	5	14	20	17	7	7	7	7	7	7
1978	7	5	5	65	32	169	7	7	7	7	7	7
1979	7	5	5	16	37	17	7	7	7	7	7	7
1980	7	5	5	63	651	31	7	7	7	7	7	7
1981	7	5	5	39	20	17	7	7	7	7	7	7
1982	7	5	10	143	199	85	593	7	7	7	7	7
1983	7	6	33	322	726	1,068	144	53	7	7	7	7
1984	7	7	128	14	20	17	7	7	7	7	7	7
1985	7	5	5	14	32	17	7	7	7	7	7	7
1986	7	5	5	14	542	385	7	7	7	7	7	7
1987	7	5	5	14	24	17	7	7	7	7	7	7
1988	7	5	5	14	20	17	7	7	7	7	7	7
1989	7	5	5	14	20	17	7	7	7	7	7	7
1990	7	5	5	14	20	17	7	7	7	7	7	7
1991	7	5	5	14	20	28	7	7	7	7	7	7
1992	7	5	5	14	52	17	7	7	7	7	7	7
1993	7	5	5	53	210	39	7	7	7	7	7	7
1994	7	5	5	14	23	17	7	7	7	7	7	7
1995	7	5	5	293	20	661	7	7	7	7	7	7
1996	7	5	5	84	588	210	7	7	7	7	7	7
1997	7	11	176	830	20	17	7	7	7	7	7	7
1998	7	5	5	166	1,247	97	90	7	7	7	7	7
1999	7	5	5	27	61	17	39	7	7	7	7	7
2000	7	5	5	33	73	78	7	7	7	7	7	7
2001	7	5	5	14	21	21	7	7	7	7	7	7
2002	7	5	10	14	20	17	7	7	7	7	7	7

Key

Periods when MOU release is being made

Periods of less flow compared to existing setting

Table 3-5b

Changes in Flow at Confluence, Comparison of WSIP and Existing Operation – Average Monthly CFS

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	7	5	0	-100	-24	14	6	6	7	7	7	7
1922	7	5	0	10	-62	-2	4	6	7	7	7	7
1923	7	5	-46	-21	-3	16	6	7	7	7	7	7
1924	7	5	5	14	20	17	7	7	7	7	7	7
1925	7	5	4	13	10	16	5	6	7	7	7	7
1926	7	5	5	14	-187	17	3	7	7	7	7	7
1927	7	4	4	10	-51	13	5	6	6	7	7	7
1928	7	5	3	12	16	-63	-3	7	7	7	7	7
1929	7	5	4	13	19	16	7	7	7	7	7	7
1930	7	5	5	11	18	7	6	6	7	7	7	7
1931	7	5	5	13	20	17	7	7	7	7	7	7
1932	7	5	0	10	11	16	7	7	7	7	7	7
1933	7	5	5	12	19	16	6	6	7	7	7	7
1934	7	5	3	10	16	16	7	7	7	7	7	7
1935	7	5	5	5	19	14	0	5	7	7	7	7
1936	7	5	5	12	-108	14	4	6	7	7	7	7
1937	7	5	5	13	-65	-53	2	5	7	7	7	7
1938	7	5	0	8	-52	-2	-3	5	7	7	7	7
1939	7	5	4	13	18	15	7	7	7	7	7	7
1940	7	5	5	5	-175	-2	-3	5	7	7	7	7
1941	7	5	1	-16	-116	-2	-3	3	7	7	7	7
1942	7	5	0	-90	-36	11	2	3	7	7	7	7
1943	7	4	4	-113	-24	-2	4	6	7	7	7	7
1944	7	5	5	13	14	12	8	6	7	7	7	7
1945	7	5	5	13	-113	13	5	5	7	7	7	7
1946	7	5	-76	-17	17	15	5	6	7	7	7	7
1947	7	4	4	13	19	15	5	6	7	7	7	7
1948	7	5	5	13	20	15	4	5	7	7	7	7
1949	7	5	5	13	19	-109	5	6	7	7	7	7
1950	7	5	5	9	14	16	6	6	7	7	7	7
1951	7	0	-51	-39	-15	5	6	6	7	7	7	7
1952	7	5	0	-121	-1	-2	2	5	7	7	7	7
1953	7	5	0	-121	18	13	6	5	7	7	7	7
1954	7	5	5	11	15	13	5	6	7	7	7	7
1955	7	5	2	9	19	16	6	6	7	7	7	7
1956	7	5	-118	-1	-1	12	5	6	7	7	7	7
1957	7	5	5	13	13	15	6	5	7	7	7	7
1958	7	5	4	9	-51	-2	-3	3	7	7	7	7
1959	7	5	5	11	10	16	6	7	7	7	7	7
1960	7	5	5	13	15	17	7	7	7	7	7	7
1961	7	5	5	13	20	16	7	7	7	7	7	7
1962	7	5	5	14	-53	12	6	6	7	7	7	7
1963	6	5	4	-44	-108	12	2	1	7	7	7	7
1964	7	4	5	9	19	16	7	6	7	7	7	7
1965	7	5	-19	-185	16	16	55	5	7	7	7	7
1966	7	4	2	11	16	16	7	7	7	7	7	7
1967	7	5	1	-79	-20	-25	-3	1	7	7	7	7
1968	7	5	5	8	17	14	6	6	7	7	7	7
1969	7	5	3	-120	-1	-2	4	6	7	7	7	7
1970	7	5	4	-106	17	-18	6	6	7	7	7	7
1971	7	4	-20	9	19	14	5	6	7	7	7	7
1972	7	5	3	13	19	17	7	7	7	7	7	7
1973	7	1	3	-125	-1	-2	4	6	7	7	7	7
1974	7	2	-13	-88	19	23	-3	5	6	7	7	7
1975	7	5	4	13	-236	-15	-3	5	7	7	7	7
1976	7	5	5	14	20	17	7	7	7	7	7	7
1977	7	5	5	13	20	17	7	7	7	7	7	7
1978	7	5	4	-150	132	-33	1	5	7	7	7	7
1979	7	5	5	11	10	12	5	6	7	7	7	7
1980	7	5	3	-116	-108	-2	4	6	7	7	7	7
1981	7	5	5	6	19	10	6	6	7	7	7	7
1982	7	3	2	-120	-1	-2	-3	3	7	7	7	7
1983	7	3	0	-121	-1	-2	-3	11	6	7	7	7
1984	7	1	-56	12	19	16	6	6	7	7	7	7
1985	7	3	4	13	18	14	7	6	7	7	7	7
1986	7	5	5	13	-225	-2	3	6	7	7	7	7
1987	7	5	5	13	19	16	7	7	7	7	7	7
1988	7	5	4	13	20	17	7	7	7	7	7	7
1989	7	5	5	13	20	16	7	7	7	7	7	7
1990	7	5	5	13	19	17	7	7	7	7	7	7
1991	7	5	5	14	20	9	6	7	7	7	7	7
1992	7	5	5	13	-74	14	6	6	7	7	7	7
1993	7	5	4	-187	-116	-2	5	5	7	7	7	7
1994	7	5	5	13	15	16	7	6	7	7	7	7
1995	7	5	5	-271	16	-17	2	5	6	7	7	7
1996	7	5	4	-84	-53	-2	5	5	6	7	7	7
1997	7	1	-89	-1	16	16	6	6	7	7	7	7
1998	7	4	3	-117	-12	-2	-3	3	5	6	7	7
1999	7	5	4	10	-51	13	23	5	6	7	7	7
2000	7	5	5	11	-169	-41	6	6	7	7	7	7
2001	7	5	1	13	12	11	6	6	7	7	7	7
2002	7	5	5	11	19	13	6	6	7	7	7	7

Key

Reduction in flow

Table 3-6a
Flow at Confluence

Flow below Alameda/Calaveras Creek Confluence - Average Monthly CFS												WSIP
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)												Sep
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	7	5	45	201	429	270	146	10	7	7	7	7
Above Nor	7	5	20	60	142	108	32	7	7	7	7	7
Normal	7	5	16	18	35	25	9	7	7	7	7	7
Below Nor	7	5	5	14	22	21	7	7	7	7	7	7
Dry	7	5	5	14	21	17	7	7	7	7	7	7
All Years	7	5	18	61	129	88	40	8	7	7	7	7

Flow below Alameda/Calaveras Creek Confluence - Average Monthly CFS												Existing
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)												Sep
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	1	56	280	467	272	144	5	1	0	0	0
Above Nor	0	1	25	114	216	110	25	2	0	0	0	0
Normal	0	0	23	24	57	26	5	1	0	0	0	0
Below Nor	0	0	1	3	6	7	1	1	0	0	0	0
Dry	0	0	0	1	2	1	1	0	0	0	0	0
All Years	0	1	21	84	149	83	35	2	0	0	0	0

Difference in Flow below Alameda/Calaveras Creek Confluence - Average Monthly CFS												WSIP minus Existing
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)												Sep
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	7	4	-11	-79	-37	-1	1	5	6	7	7	7
Above Nor	7	4	-5	-54	-74	-2	7	5	7	7	7	7
Normal	7	5	-6	-6	-22	-1	5	6	7	7	7	7
Below Nor	7	5	4	11	16	14	6	6	7	7	7	7
Dry	7	5	5	13	19	16	7	7	7	7	7	7
All Years	7	5	-3	-23	-20	5	5	6	7	7	7	7

Table 3-6b
Flow at Confluence

Flow below Alameda/Calaveras Creek Confluence - Acre-feet													WSIP
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)													WY Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	325	2,783	12,365	23,847	16,623	8,658	606	416	430	430	417	67,329
Above Nor	438	326	1,259	3,707	7,904	6,614	1,885	431	417	430	430	417	24,258
Normal	430	304	1,006	1,103	1,933	1,540	556	430	416	430	430	417	8,995
Below Nor	430	297	325	888	1,213	1,300	440	430	417	431	430	417	7,018
Dry	430	297	308	843	1,168	1,071	441	431	416	430	430	417	6,681
All Years	432	310	1,128	3,745	7,148	5,394	2,366	465	416	430	430	417	22,680

Flow below Alameda/Calaveras Creek Confluence - Acre-feet													Existing
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)													WY Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	3,465	17,243	25,909	16,711	8,598	307	30	12	4	2	72,361
Above Nor	12	68	1,554	7,035	11,987	6,754	1,462	103	22	6	2	1	29,007
Normal	1	29	1,397	1,501	3,154	1,586	284	60	9	2	0	0	8,022
Below Nor	1	22	78	186	338	450	72	41	7	0	0	0	1,195
Dry	1	6	26	35	124	69	43	23	1	0	0	0	328
All Years	3	41	1,292	5,161	8,250	5,077	2,060	106	14	4	1	1	22,010

Difference in Flow below Alameda/Calaveras Creek Confluence - Acre-feet													WSIP minus Existing
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)													WY Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	246	-681	-4,878	-2,062	-88	61	299	386	418	425	415	-5,032
Above Nor	426	258	-295	-3,329	-4,083	-139	423	328	395	424	428	416	-4,749
Normal	429	275	-391	-398	-1,221	-46	271	371	407	428	430	417	973
Below Nor	429	275	246	702	876	850	368	389	410	430	430	417	5,824
Dry	429	291	282	808	1,044	1,001	398	408	415	430	430	417	6,353
All Years	429	269	-164	-1,416	-1,102	317	306	359	402	426	429	416	671

Table 3-7
Estimated Flow Diverted at Recapture Facility – WSIP Operations

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	7	5	0	0	11	14	6	6	7	7	7	7
1922	7	5	0	0	0	0	4	6	7	7	7	7
1923	7	5	0	7	15	16	6	7	7	7	7	7
1924	7	5	5	14	20	17	7	7	7	7	7	7
1925	7	5	4	13	10	16	5	6	7	7	7	7
1926	7	5	5	14	4	17	3	7	7	7	7	7
1927	7	4	4	10	0	13	3	6	6	7	7	7
1928	7	5	3	12	16	0	1	7	7	7	7	7
1929	7	5	4	13	19	16	7	7	7	7	7	7
1930	7	5	5	11	18	7	6	6	7	7	7	7
1931	7	5	5	13	20	17	7	7	7	7	7	7
1932	7	5	0	10	11	16	7	7	7	7	7	7
1933	7	5	5	12	19	16	6	6	7	7	7	7
1934	7	5	3	10	16	16	7	7	7	7	7	7
1935	7	5	5	5	19	14	0	5	7	7	7	7
1936	7	5	5	12	4	14	4	6	7	7	7	7
1937	7	5	5	13	7	0	2	5	7	7	7	7
1938	7	5	0	8	0	0	1	5	7	7	7	7
1939	7	5	4	13	18	15	7	7	7	7	7	7
1940	7	5	5	5	0	0	0	5	7	7	7	7
1941	7	5	1	3	0	0	0	3	7	7	7	7
1942	7	5	0	0	0	0	11	3	7	7	7	7
1943	7	4	4	0	13	0	4	6	7	7	7	7
1944	7	5	5	13	14	12	6	6	7	7	7	7
1945	7	5	5	13	5	13	5	5	7	7	7	7
1946	7	5	0	7	17	15	5	6	7	7	7	7
1947	7	4	4	13	19	15	5	6	7	7	7	7
1948	7	5	5	13	20	15	4	5	7	7	7	7
1949	7	5	5	13	19	3	5	6	7	7	7	7
1950	7	5	5	9	14	16	6	6	7	7	7	7
1951	7	0	0	7	14	0	6	6	7	7	7	7
1952	7	5	0	0	0	0	2	5	7	7	7	7
1953	7	5	0	2	18	13	6	5	7	7	7	7
1954	7	5	5	11	15	13	5	6	7	7	7	7
1955	7	5	2	9	19	16	6	6	7	7	7	7
1956	7	5	0	0	0	12	5	6	7	7	7	7
1957	7	5	5	13	13	15	6	5	7	7	7	7
1958	7	5	4	9	0	0	0	3	7	7	7	7
1959	7	5	5	11	10	16	6	7	7	7	7	7
1960	7	5	5	13	15	17	7	7	7	7	7	7
1961	7	5	5	13	20	16	7	7	7	7	7	7
1962	7	5	5	14	6	12	6	6	7	7	7	7
1963	6	5	4	1	0	12	0	1	7	7	7	7
1964	7	4	5	9	19	16	7	6	7	7	7	7
1965	7	5	0	0	16	16	0	5	7	7	7	7
1966	7	4	2	11	16	16	7	7	7	7	7	7
1967	7	5	1	0	13	0	0	1	7	7	7	7
1968	7	5	5	8	17	14	6	6	7	7	7	7
1969	7	5	3	0	0	0	4	6	7	7	7	7
1970	7	5	4	0	17	8	6	6	7	7	7	7
1971	7	4	0	9	19	14	5	6	7	7	7	7
1972	7	5	3	13	19	17	7	7	7	7	7	7
1973	7	1	3	0	0	0	4	6	7	7	7	7
1974	7	2	0	0	0	0	0	5	6	7	7	7
1975	7	5	4	13	0	0	1	5	7	7	7	7
1976	7	5	5	14	20	17	7	7	7	7	7	7
1977	7	5	5	13	20	17	7	7	7	7	7	7
1978	7	5	4	0	8	0	1	5	7	7	7	7
1979	7	5	5	11	10	12	5	6	7	7	7	7
1980	7	5	3	0	0	10	4	6	7	7	7	7
1981	7	5	5	6	19	10	6	6	7	7	7	7
1982	7	3	2	0	0	8	0	3	7	7	7	7
1983	7	3	0	0	0	0	0	0	6	7	7	7
1984	7	1	0	12	19	16	6	6	7	7	7	7
1985	7	3	4	13	18	14	7	6	7	7	7	7
1986	7	5	5	13	0	0	3	6	7	7	7	7
1987	7	5	5	13	19	16	7	7	7	7	7	7
1988	7	5	4	13	20	17	7	7	7	7	7	7
1989	7	5	5	13	20	16	7	7	7	7	7	7
1990	7	5	5	13	19	17	7	7	7	7	7	7
1991	7	5	5	14	20	9	6	7	7	7	7	7
1992	7	5	5	13	6	14	6	6	7	7	7	7
1993	7	5	4	0	0	10	5	5	7	7	7	7
1994	7	5	5	13	15	16	7	6	7	7	7	7
1995	7	5	5	0	16	0	2	5	6	7	7	7
1996	7	5	4	1	0	0	5	5	6	7	7	7
1997	7	1	0	0	16	16	6	6	7	7	7	7
1998	7	4	3	0	0	0	0	3	5	6	7	7
1999	7	5	4	10	7	13	0	5	6	7	7	7
2000	7	5	5	11	3	0	6	6	7	7	7	7
2001	7	5	5	13	12	11	6	6	7	7	7	7
2002	7	5	1	11	12	13	6	6	7	7	7	7

Key

Periods when MOU release is being made

Periods of less flow at confluence compared to existing setting

Table 3-8a

Estimated Flow Diverted at Recapture Facility, WSIP Operations – Average Monthly CFS

Total Recaptured MOU Release - Average Monthly CFS (Average within Year Type - Grouped by 5 Local Reservoir Runoff)												WSIP Sep
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
Wet	7	4	2	2	3	4	2	4	6	7	7	7
Above Norr	7	4	3	5	7	6	3	5	7	7	7	7
Normal	7	5	3	9	13	12	5	6	7	7	7	7
Below Norr	7	5	4	11	16	14	6	6	7	7	7	7
Dry	7	5	5	13	19	16	7	7	7	7	7	7
All Years	7	5	3	8	11	10	5	6	7	7	7	7

Table 3-8b

Estimated Flow Diverted at Recapture Facility, WSIP Operations – Acre-feet

Total Recaptured MOU Release - Acre-feet (Average within Year Type - Grouped by 5 Local Reservoir Runoff)												WSIP Sep	WY Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug		
Wet	430	246	117	132	160	217	123	256	386	418	425	415	3,324
Above Norr	426	258	173	310	366	339	166	328	395	424	428	416	4,028
Normal	429	275	195	576	725	729	286	371	407	428	430	417	5,268
Below Norr	429	275	246	702	876	850	368	389	410	430	430	417	5,824
Dry	430	291	282	808	1,044	1,001	398	408	415	430	430	417	6,353
All Years	429	269	203	506	634	627	268	350	402	426	429	416	4,959

4. Disaggregation of Monthly Analysis

The results described previously use the monthly time-step HH/LSM model to provide conclusions regarding long-term, systematic changes to system operations and affected stream flows. Certain data sets within HH/LSM have been developed to recognize the occurrence of daily hydrology; however, some decision processes and elements of hydrology that have been implemented in the model on a monthly basis lead to a less than full depiction of anticipated operations. For Alameda Creek operations an additional level of analysis has been prepared to provide additional insight into the comparison of stream flows between existing and WSIP operations.

The topic of investigation for this additional analysis is the disposition and occurrence of flow at ACDD as it is affected by diversions to Calaveras Reservoir. HH/LSM is a monthly time-step model that uses data that has been processed into monthly volumes and average monthly flow rates. The data used by the model for inflow to ACDD is a combination of synthesized and measured flow records, representing the volume of flow that has occurred during history within a particular month. Without the addition of other data or protocols to address the data differently, the model would treat the data as if it occurs on an evenly distributed pattern during a month. With a facility such as the ACDD diversion structure such treatment could lead to unrepresentative results for the reasons set forth below.

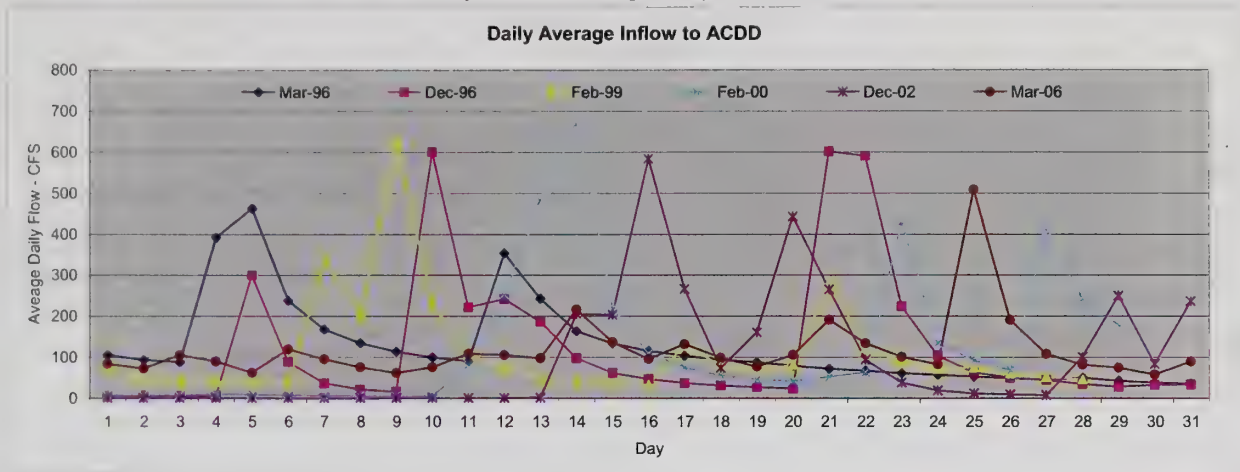
The tunnel diversion structure has an estimated capacity of about 650 cfs, which for a month of constant operation would be capable of diverting about 38,000 acre-feet, a volume exceeding the maximum recorded runoff for any month in history. The large design capacity of the structure is intended to capture instantaneous flows associated with the “flashy” nature of runoff from the watershed. Within a day of runoff, peak instantaneous flows can far exceed 650 cfs and thus, even with diversions occurring, not all of the flow would be diverted and the remainder would spill past the ACDD to the stream. Using only the model’s knowledge of monthly runoff to ACDD, the conversion of that volume to an average flow rate during a month would falsely lead the model to a result that diverts to Calaveras Reservoir the entire flow available at ACDD. This result is not reflective or consistent with reality; therefore, additional information is provided to the model to better mimic hydrology that occurs on a more frequent time-step.

The information and protocol developed involved analyzing daily average flow and operation data for Calaveras Reservoir and ACDD facilities. The analysis produced a relationship between average daily flow and “divertible” flow at ACDD. A data set representing the divertible flow is incorporated into the model along with a companion data set representing total inflow to ACDD. Diversions to Calaveras Reservoir are limited by the volumes of water identified as divertible. Working with both of these sets of data the model provides a reasonable depiction of flow diverted to Calaveras Reservoir or left in the stream below ACDD. The use of daily average data within the analysis just described is known to have its limitations of accuracy, which are associated with the daily time-step employed and the records available. However, for planning level water supply studies the results are acceptable.

With the accessibility of even more finite flow records, (e.g., 15-minute interval measurements), data assumptions for the model can be refined. But for the immediate topic of analysis the finite flow records can be used to provide an additional level of illustration of the flow changes that are anticipated for changed operations between the existing and WSIP settings.

For the purpose of illustration, a month of operation (February 1926) within the previously discussed 24-month example period was selected to demonstrate an anticipated change in system operations at ACDD. In that selected month it is anticipated that the existing operation will go from a “diversion rejection” mode to a WSIP “divert water from ACDD for replenishment” mode. Reported (USGS) 15-minute ACDD inflow data provides the underlying hydrology for this analysis. For comparison, six different months in recent history provide illustrations of differing runoff patterns that have occurred for relatively the same amount of monthly runoff assumed for February 1926 (about 7,300 acre-feet). The patterns of daily average runoff of the “similar” months are illustrated in Figure 4-1. These sample months illustrate a monthly runoff that ranges from about 6,100 acre-feet to 7,800 acre-feet. It is evident from this illustration that daily runoff can vary greatly both temporally and in magnitude, which cause is associated with the timing and magnitude of rainfall within the watershed.

Figure 4-1
Runoff Pattern of Months Similar to February 1926 – Average Daily Flow in CFS



The 15-minute interval data of these sample months was used to provide the shape of six different hydrographs for ACDD inflow. The volume of ACDD inflow for February 1926 was then shaped to these hydrographs (7,300 acre-feet). A mathematical model was developed that routed inflows to either the stream or through the diversion tunnel, based on assumptions for operations and capacity constraints. On a 15-minute time-step, model logic bypassed water at ACDD for MOU compliance, diverted water to Calaveras Reservoir up to a capacity of 650 cfs, and spilled back (rejection) to the stream any water not diverted. In addition to this logic, a diversion rejection mechanism was added to simulate Calaveras Reservoir reaching a full storage condition during the month (after about 3,000 acre-feet of diversion from ACDD, consistent with the monthly results from HH/LSM).

Figures 4-2 through 4-7 illustrate the 15-minute interval results of this analysis. This month of illustration is within one of the 31 years when at least one month of flow volume below ACDD is anticipated to be reduced due to changed operations under the WSIP operation. It also represents a month not within one of the 18 years when another month within the year when flow past ACDD is substantial and unaffected by the changed operation (the remaining 13 years of affected operation). The sample hydrographs provide a range of differing results. During this month, under each of the sample shapes of hydrograph it can be seen that at some point in the month Calaveras Reservoir will begin rejecting diversions from ACDD due to a "full reservoir" and Alameda Creek below the dam will receive the full fluctuating inflow that occurs after that time. Also, In 5 out of the 6 hydrographs, tunnel diversion capacity constrains the amount of flow that can be diverted to the tunnel and a varying amount of the flow will spill past the dam in the shape of the peak of the hydrograph. The illustration shows that during certain months of affected operation flow could occur below ACDD with a diversion to Calaveras Reservoir, and during some circumstances the instantaneous flow could be the same or more than occurred in the existing operation.

Figure 4-2
Disposition of Flow at ACDD – Sample Operation of February 1926

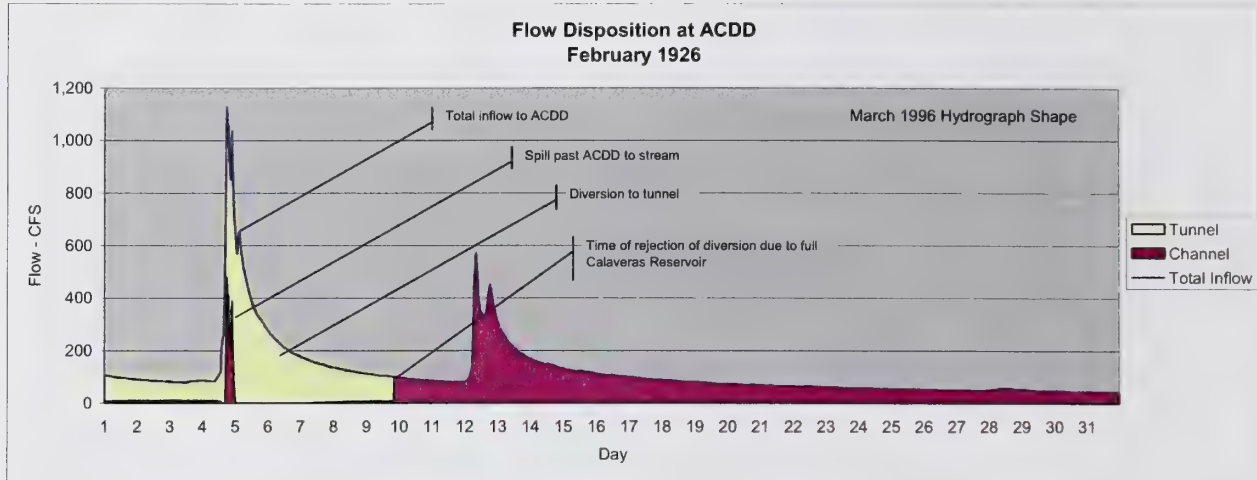


Figure 4-3
Disposition of Flow at ACDD – Sample Operation of February 1926

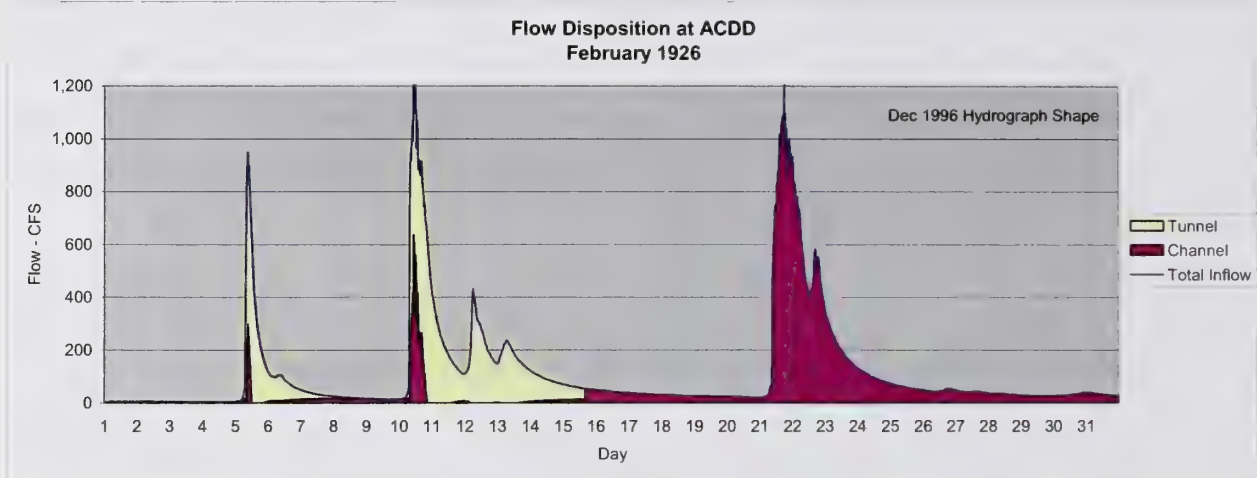


Figure 4-4
Disposition of Flow at ACDD – Sample Operation of February 1926

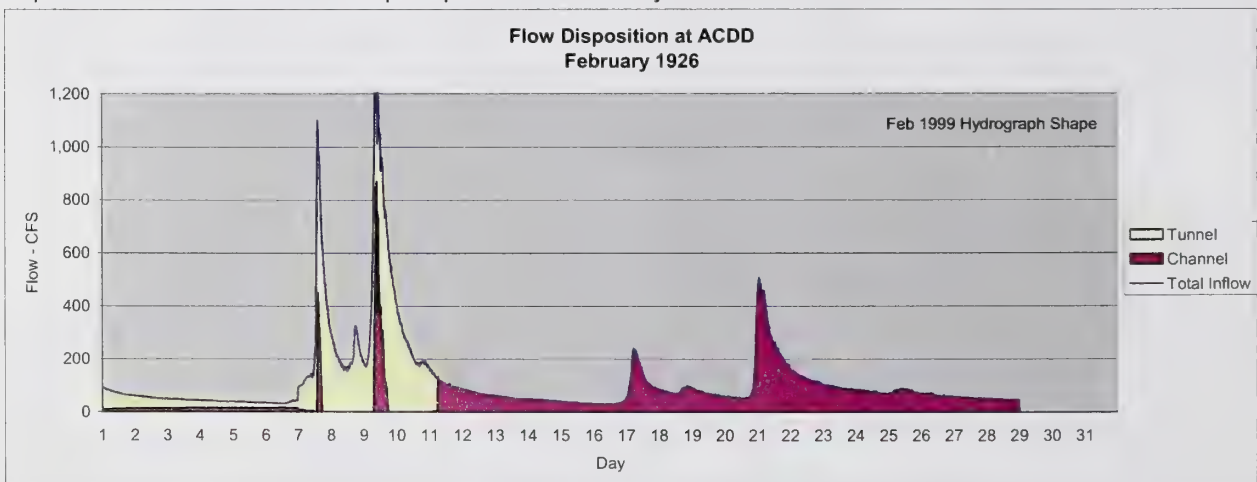


Figure 4-5
Disposition of Flow at ACDD – Sample Operation of February 1926

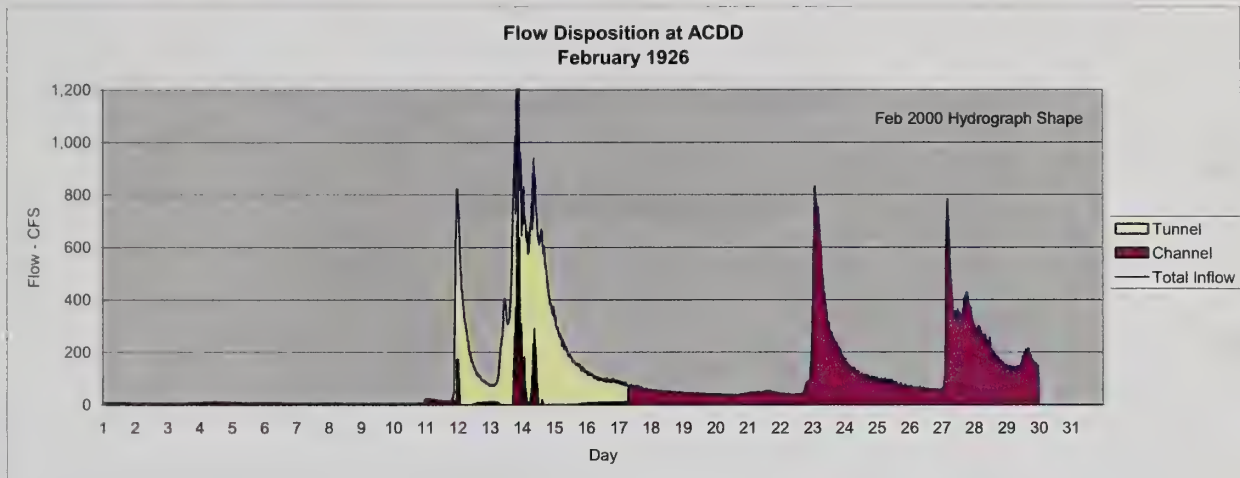


Figure 4-6
Disposition of Flow at ACDD – Sample Operation of February 1926

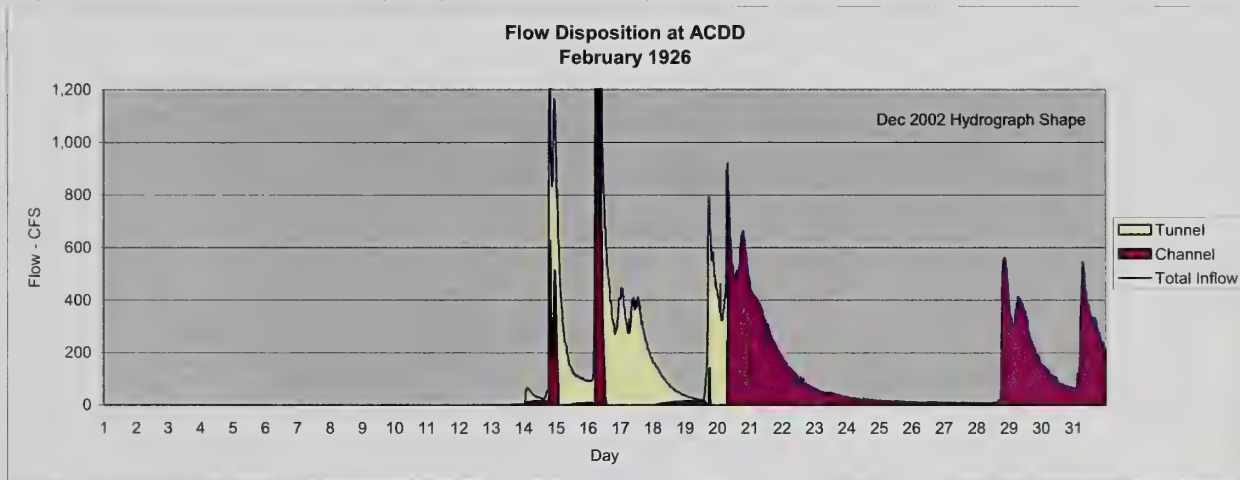
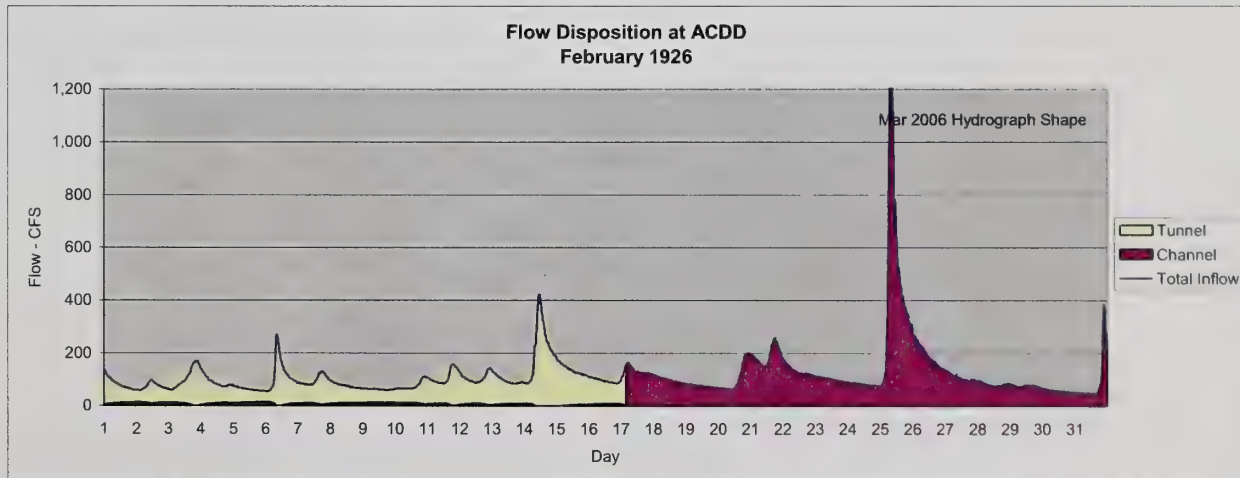


Figure 4-7
Disposition of Flow at ACDD – Sample Operation of February 1926



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Appendix E

Cultural Resources Survey Reports

Appendix E.1

Table of Cultural Resource Studies within the CDRP Cultural Resources Study Area

Table E-1: Cultural Resource Studies within the CDRP Cultural Resources Study Area

Authors	Title	Year
Environmental Science Associates	<i>Alameda Watershed Natural and Cultural Resources</i>	1994
URS Corporation	<i>Technical Memorandum, Results of Archaeological Reconnaissance of Calaveras Dam Phase I Geotechnical Investigation, Alameda County, CA</i>	2003
URS Corporation	<i>Technical Memorandum, Constraints Evaluation Cultural Resource Reconnaissance For Calaveras Dam Conceptual Engineering, Alameda and Santa Clara Counties</i>	2005
EDAW & Turnstone Joint Venture	<i>Calaveras Dam Replacement Project, Archaeological Survey Report</i>	2008
JRP Historical Consulting	<i>Calaveras Dam Replacement Project, Historic Resources Inventory and Evaluation Report</i>	2008

Appendix E.2

Archaeology Sensitive Area Alert Sheet

ALERT !

This is to notify you that this project site may be located in an **archeologically sensitive area**. If you notice anything that indicates the presence of an archeological resource within the project site, the **San Francisco Environmental Review Officer** must be contacted **immediately**. If you see anything that appears like archeological remains call: **558-5977** or **558-5980** or **558-5990**. All work within the vicinity of the discovery must stop until the Environmental Review Officer has evaluated the discovery. You should be on the lookout for both prehistoric and historical archeological sites. It is not always easy to identify archeological sites when they are encountered. Below are some things that may indicate the presence of an archeological site.

PREHISTORIC ARCHEOLOGICAL SITE

- Concentrations of shellfish remains
- Evidence of fire (ashes, charcoal, burnt earth, fire-cracked rocks)
- Concentrations of bones
- Recognizable Native American artifacts (arrowheads, shell beads, stone mortars (bowls), humanly shaped rock)

HISTORICAL ARCHEOLOGICAL SITE

- Building foundation remains
- Trash pits
- Privies (Out-house holes)
- Floor remains
- Wells
- Concentration of bottles, broken dishes, shoes, buttons, cut animal bones, hardware, household items, barrels, etc.
- Debris from the Great 1906 Earthquake and Fire (thick layers of burned building debris, charcoal, nails, fused glass, burned plaster, burned dishes, etc.)
- Wood structural remains (building, ship, wharf, etc.)
- Clay roof/floor tiles
- Stone walls or footings
- Gravestones

ALERT !

THE
FEDERAL
BUREAU OF
INVESTIGATION
OF THE
DEPARTMENT OF JUSTICE
IS
SEARCHING FOR
ALL INFORMATION
RELATIVE TO
THE
MURDER OF
DR. MARTIN LUTHER KING, JR.
ON APRIL 4, 1968, IN
MEMPHIS, TENNESSEE.
IF YOU HAVE ANY INFORMATION
PLEASE CONTACT THE
FEDERAL BUREAU OF INVESTIGATION
AT THE FOLLOWING ADDRESS:
WASHINGTON, D. C. 20535
OR
YOUR LOCAL FBI OFFICE.
YOUR COOPERATION IS APPRECIATED.

Appendix F

Traffic Calculations

Calaveras Replacement Dam Project
August-09

PROJECT TRIPS

Time Period	Daily Construction Worker Vehicles ¹				Daily Construction Vehicles on Calaveras Road ^{2,3}					DAILY TOTAL
	Day	Night	Total in and out		filter/drain	concrete aggregate	misc. deliveries	Total in and out		
Spring 2011	70	10	160		0	4	2	12		172
Summer and Fall 2011	100	20	240		43	4	2	98		338
Winter 2011	70	20	180		0	4	2	12		192
Spring 2012	70	20	180		0	4	2	12		192
Summer and Fall 2012	100	20	240		0	4	2	12		252
Winter 2012	75	20	190		80	4	2	172		362
Spring, Summer and Fall 2013	130	50	360		80	4	2	172		532
Winter 2013	90	20	220		80	4	2	172		392
Spring, Summer and Fall 2014	140	50	380		0	4	2	12		392
Winter 2014	70	20	180		0	4	2	12		192

Source:

1. Critical Information Needs Table C20.
2. Critical Information Needs Table C22. Project Description - Construction Schedule and Cost SUPERSEDED MAY 2009
Importing of sand and gravel would not occur until 2010 and would last about a year
3. Revised May 2009 based on February 6, 2009 memo CUQ37401-Calaveras Dam Replacement Project Estimated Truck Trips to Project and On-Site
4. Revised August 2009 based on SFPUC revisions to filter/drain imports

Assumptions:

1. For worker trips assumed half of Day shift and half of Night shift would travel during the peak hour
2. Project truck trips include:
 - import filter/drain for Disposal Sites
 - import filter/drain for Dam
 - concrete aggregate
 - misc deliveries
3. Project truck trips distributed evenly over a 10-hour period

PROPOSED PROJECT ANALYSIS**EXISTING VOLUMES****EXISTING HCS ANALYSIS**

	Volumes	
AM Peak Hour	sb	nb
PM Peak Hour	54	25
	17	86

	Directional Split	
	sb	nb
	68%	32%
	17%	83%

	Auto %	Truck %
	50%	50%
	70%	30%

PROJECT VOLUMES

	Workers		Trucks	
	sb	nb	sb	nb
	65	25	9	9
	25	65	9	108
				108

EXISTING PLUS PROJECT VOLUMES**PREFERRED PROJECT**

	sb	nb
AM Peak Hour	128	59
PM Peak Hour	51	160

	sb	nb
	69%	31%
	24%	76%

	Auto %	Truck %
	70%	30%
	77%	23%

EXISTING TRAFFIC VOLUMES AND VEHICLE CLASSIFICATION**Traffic Volumes****Southbound I-680**

	Southbound I-680	Total
Calaveras - South of I-680		
Weekday - Daily	550	1130
Weekday - AM Peak	60	80
Weekday - PM Peak	20	80
Friday - Daily	490	1290
Friday - AM Peak	50	70
Friday - PM Peak	20	160
Saturday - Daily	610	1150

Vehicle Classification

	auto	2 axle truck	3+axle truck	Total
Calaveras - South of I-680				
Weekday - Daily	46%	33%	21%	100%
Weekday - AM Peak	41%	31%	28%	100%
Weekday - PM Peak	64%	35%	1%	100%
Friday - Daily	55%	27%	18%	100%
Friday - AM Peak	49%	29%	22%	100%
Friday - PM Peak	73%	26%	1%	100%
Saturday - Daily	76%	23%	1%	100%

AVERAGE

	Southbound I-680	Total
Weekday - AM Peak	54	79
Weekday - PM Peak	17	103

	Auto %	Truck %
Weekday - AM Peak	50%	50%
Weekday - PM Peak	70%	30%

Calaveras - South of Geary

	Southbound I-680	Total
Weekday - Daily	60	180
Friday - Daily	60	440
Saturday - Daily	120	320

Source: LCW Consulting, 24-hour traffic counts conducted October 18 through October 21, 2006

Appendix G

Air Quality Modeling

Calaveras Dam Worst-Case Unmitigated Short-term Construction-Related Emissions

Exhaust Emissions of ROG, NOx, CO, and PM10

Emissions are calculated for the worst-case construction season (2013)

Worker Commute Emissions

	Values			
Miles/one-way trip	20.00	Default Model Setting		
One-way trips/day	2.00	Default Model Setting		
No. of employees	130.00	Worst-case number of daily employees from project description.		
			2.00 10-hour shifts per day	
			22.00 days per month	
			12.00 months	
Pounds per day*	ROG	NOx	CO	PM10
Tons per const. Period	2.21	2.73	33.54	0.52
	0.29	0.36	4.43	0.07

*Based on EMFAC emission factors.

Off-Site, On-Road Material Transport Emissions

Material Transport	30.00	Default Model Setting
Miles/round trip	62.00	
Round trips/day		
Vehicle miles traveled/day (calculated)	1860.00	

298000 yd3 of filter and drain, 16556 truck loads of 18 yd3, 264 days per year (22 days per month), 62 round trips/day

22.00 days per month
12.00 months

	ROG	NOx	CO	PM10
Emission rate (grams/mile)	0.84	10.25	5.45	0.40
Pounds per day	3.10	37.90	20.20	1.50
Tons per construction period	0.41	5.00	2.67	0.20

*Based on EMFAC emission factors.

On-Site, Off-Road Heavy-Duty Equipment Emissions

Number of Vehicles	Type	ROG	NOx	CO	PM10
		pounds/day	pounds/day	pounds/day	pounds/day
2	Compactor	0.2	1.3	1.1	0.1
2	Dozer	12.8	109.2	56.7	4.5
2	Excavator	5.0	45.5	14.2	1.5
2	Loaders, Rubber Tired	5.0	48.6	14.7	1.7
10	Off-Highway Trucks	43.4	127.2	229.8	12.7
2	Other Construction Equip.	4.0	28.1	21.1	2.3
2	Scaper	9.0	82.0	25.6	3.2
	Pounds per day*	79.40	441.85	363.22	25.95
	Tons per const. Period	10.48	58.32	47.95	3.43

*Based on Off-Road emission factors

Max hours assumes full equipment

Max HP	Avg HP	Load Factor	Max Hours Per Active Month
15.00	8.00	0.43	189.20
500.00	358.00	0.59	259.60
250.00	222.00	0.57	250.80
250.00	220.00	0.54	237.60
500.00	381.00	0.57	250.80
120.00	104.00	0.62	272.80
250.00	232.00	0.72	316.80

Fugitive Emissions of PM10

Acre	PM10
	pounds/day
Disposal 2	16.60
Disposal 3	39.00
Disposal 5	60.00
Disposal 7	17.00 *
Borrow B	8.00 *
Borrow E	85.00 *
Existing Dam Footprint	21.00 *
New Dam Footprint	18.00
Staging Areas	35.00 *

Disturbance Area

*Based on an emission factor of 38.2 lb/acre/day (ARB 2002)

41.75

Miles Traveled

2204.56

Haul Truck Travel

*Based on an emission factor of 2.27 lb PM10/VMT (ARB 2002)

Disposal of 3.8 million yd3 (30% 2013, 70% 2014):

pounds/day	1251.1 site #	distance
270000.00	0.40	
720000.00	0.90	
252000.00	3.40	
	Table 3-4	
	Table 3-4	

Yearly
10800.00
64800.00
85680.00

Daily VMT
54.55
327.27
432.73

9.00 months
9.00 months
9.00 months

Disposal 7	318000.00	1.00	Table 3-4	160.61	31800.00	9.00 months
pounds/day	Transport of 2.8 million yd3 (70% 2013, 30% 2014)	distance				
1645.8 site #		yd3				
tons/year	Borrow E	528500.00	3.40 Table 3.3	Daily	Yearly	7.00 months
166.26 Borrow B		534800.00	0.50 Table 3.3	1014.62 *	179690.00	5.00 months
Spillway		945000.00	0.01	211.38 *	26740.00	11.00 months
				3.40 *	945.00	
				2204.56	400455.00	

* Assumes a 75% reduction in fugitive PM10 dust emissions from implementation of best management practices in the project described "same year"

Total 2013 (Unmitigated)

ROG	NOx	CO	PM10 Exhaust	PM10 Fugitive Dust	PM10
pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
84.71	482.48	416.96	27.97	3299.59	3327.56
tons/year	tons/year	tons/year	tons/year	tons/year	tons/year
11.18	63.69	55.04	3.69	332.52	336.21

Total 2013 (Mitigated)

ROG	NOx	CO	PM10 Exhaust	PM10 Fugitive Dust	PM10
pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
80.74	394.11	398.80	22.38	3299.59	3321.97
tons/year	tons/year	tons/year	tons/year	tons/year	tons/year
10.66	52.02	52.64	2.95	332.52	335.47

Exhaust Emissions of CO2E 2013 (Worst-Case Year)

Disposal of 3.8 million yd3 (30% in 2013): site #	distance	Daily VMT	9.00 months	
Disposal 2	270000.00	54.55	9.00 months	
Disposal 3	720000.00	327.27	9.00 months	
Disposal 7	318000.00	160.61	9.00 months	
Transport of 2.8 million yd3 (70% in 2013): site #	distance	Daily	Yearly	
Borrow E	528000.00	3428.57	528000.00	7.00 months
Borrow B	534800.00	4861.82	534800.00	5.00 months
Spillway	945000.00	3904.96	945000.00	11.00 months
		12195.35	2007800.00	
			7605.30	
Fuel Burned	Earth Moved (yd3) (Day based on Worst-Case Year)			
	7605.30		gallons/day	
	*Based on an emission factor of 0.27 gallons/burned per yd3 of earth moved (BAAQMMD 1999).		2053.4	
			gallons/year	
			542106.00	
CO2	Fuel Burned (gallon) (Day based on Worst-Case Year)		lb/day	TOTALS
	2053.43		45093.4	CO2 to CO2e
	*Based on an emission factor of 9.96 kg of CO2 (21.96) per gallon CA Lowq Sulfur Diesel fuel emissions factors from CCAR (CCAR 2007).		tons/year	45093.36 lb/day
			5952.32	CO2e
				5952.32 ton/year
Miles Traveled	Fuel Burned (gallon) (Day based on Worst-Case Year)		miles/day	
	2053.43		10267.2	
	*Based on an emission factor of 9.96 kg of CO2 (21.96) per gallon CA Lowq Sulfur Diesel fuel emissions factors from CCAR (CCAR 2007).		miles/year	
			2710530.00	
CH4	Miles Traveled (Day based on Worst-Case Year)		lb/day	CH4 to CO2e
	10267.16		1.8	38.03 ton/year
	*Based on an emission factor of 9.96 kg of CO2 (21.96) per gallon CA Lowq Sulfur Diesel fuel emissions factors from CCAR (CCAR 2007).		ton/year	CO2e
0.08 g	0.00		0.24	5.02 ton/year
				CO2e
N2O	Miles Traveled (Day based on Worst-Case Year)		lb/day	N2O to CO2e
	10267.16		1.1	350.84 lb/day
	*Based on an emission factor of 9.96 kg of CO2 (21.96) per gallon CA Lowq Sulfur Diesel fuel emissions factors from CCAR (CCAR 2007).		ton/year	CO2e
0.08 g	0.00		0.15	46.31 ton/year
				CO2e
				CO2e
				45482.24 lb/day
				6003.66 ton/year

Appendix H

1997 Memorandum of Understanding California Department of Fish and Game

DEPARTMENT OF FISH AND GAME

POST OFFICE BOX 47
YOUNTVILLE, CALIFORNIA 94599
(707) 944-5500



July 25, 1997

Mr. Anson B. Moran
General Manager
San Francisco Public
Utilities Commission
1155 Market Street, Fourth Floor
San Francisco, California 94102

Dear Mr. Moran:

Enclosed is the original "Memorandum of Understanding (MOU) Between the City and County of San Francisco Public Utilities Commission and the California Department of Fish and Game Regarding Water Releases and Recapture Facilities for Purposes of Improving Native Fisheries on Alameda Creek."

Please sign the MOU, obtain the appropriate signatures for the City and County of San Francisco and return a completed copy to us at the letterhead address.

Sincerely,

A handwritten signature in dark ink, appearing to read "Brian Hunter", is written over a horizontal line.

Brian Hunter
Regional Manager
Region 3

Enclosure

**MEMORANDUM OF UNDERSTANDING BETWEEN THE
CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
AND
THE CALIFORNIA DEPARTMENT OF FISH AND GAME
REGARDING WATER RELEASE AND RECAPTURE FACILITIES
FOR PURPOSES OF IMPROVING NATIVE FISHERIES
ON ALAMEDA AND CALAVERAS CREEKS**

This Memorandum of Understanding (MOU) is entered into as of _____, 1997 by and between the San Francisco Public Utilities Commission (SFPUC), and the California Department of Fish and Game (CDFG).

RECITALS

A. The CDFG is responsible for protecting, managing and enhancing fish and wildlife resources of the State.

B. The SFPUC supplies water for domestic, municipal and industrial uses to over 2 million people in San Francisco, San Mateo, Santa Clara and Alameda Counties.

C. In a letter complaint to the State Water Resources Control board (SWRCB) dated September 25, 1990, the organization California Trout (Cal Trout) contended that (1) the SFPUC lacked sufficient water rights to store water in Calaveras Reservoir in Alameda and Santa Clara Counties; (2) the SFPUC's failure to release water from Calaveras Reservoir violated section 5937 of the California Fish and Game Code; and (3) the SFPUC diverted water in an unreasonable manner from Calaveras Reservoir, pursuant to Article X, section 2 of the California Constitution.

D. On May 1, 1991, the SFPUC submitted evidence to the SWRCB of its pre-1914 appropriative water right for Calaveras Dam, and the SWRCB accepted this evidence as sufficient to establish the SFPUC's water right on a *prima facie* basis.

E. In an attempt to settle the operational aspects of the Cal Trout complaint, the SFPUC agreed to fund a study (the Alameda Creek Water Resources Study) to determine the reasonableness of delivering a portion of the water stored at Calaveras Reservoir via the stream channel of Calaveras and Alameda Creeks, with the primary goal being to improve fishery conditions while recapturing all of the water released for consumptive use.

F. The SFPUC has completed the Alameda Creek Water Resources Study, and has determined that water may be released from Calaveras Reservoir for the improvement of native

game and non-game fish populations, and that a suitable point exists for the recapture of water released in the vicinity of the SFPUC's Sunol Valley Water Treatment Plant.

G. The CDFG has agreed to a program of water releases and recapture between Calaveras Reservoir and Sunol Valley which will promote biodiversity through the improvement of habitat conditions for both native game fish, such as trout, and native non-game fish, which prefer warmer water temperatures (Fisheries Management Alternative 4 in Table 3.1 of the Alameda Creek Water Resources Study).

H. The SFPUC and the CDFG have reached agreement on the magnitude and timing of flows to be released from Calaveras Reservoir, and the parties wish to memorialize their respective obligations regarding the schedule of flow releases and measurement of fishery flows, monitoring of water quality and quantity, and the construction of the SFPUC's water recapture facility.

NOW, THEREFORE, IT IS HEREBY AGREED AS FOLLOWS:

Section 1 -- Definitions

Abbreviations, words and phrases used in this MOU shall have the following meanings:

- 1.1 "Alameda Creek Water Resources Study" means the January, 1995 study performed by Bookman-Edmonston Engineering, Inc. (B-E) for the SFPUC.
- 1.2 "B-E" means Bookman Edmonston Engineering, Inc., consultant to the SFPUC.
- 1.3 "CDFG" means the California Department of Fish and Game.
- 1.4 "CFS" means a flow of water measured in cubic feet per second.
- 1.5 "Commission" means the California Fish and Game Commission.
- 1.6 "EBRPD" means the East Bay Regional Park District.
- 1.7 "Preferred Alternative" means Fisheries Management Alternative 4 in the Alameda Creek Water Resources Study, with the point of water recapture located in the vicinity of the Sunol Valley Water Treatment Plant.
- 1.8 "Project Area" means the area and SFPUC facilities shown on Appendix 1.
- 1.9 "SFPUC" means the San Francisco Public Utilities Commission, a commission created under the Charter of the City and County of San Francisco for purposes of

overseeing the operations of the City's utilities within and outside of San Francisco.

- 1.10 "SVWTP" means the Sunol Valley Water Treatment Plant operated by the SFPUC.
- 1.11 "Water Releases" means water released by the SFPUC from, or which bypasses, the SFPUC's water storage and diversion facilities on Alameda and Calaveras Creeks as shown on Appendix 1.

Section 2 -- Alameda Creek Water Resources Study Findings and Conclusions

The Alameda Creek Water Resources Study made certain findings and conclusions which have guided the SFPUC in developing the Calaveras Reservoir stream release and recapture program which is the subject of this MOU. Pertinent findings and conclusions include:

- 2.1 The existing Alameda Creek fishery within the Project Area contains an assemblage of native, predominantly warm water fish, including Sacramento sucker, Sacramento squawfish, California roach, and threespine stickleback. Alameda Creek also contains small populations of native, cold water species, such as Pacific lamprey and rainbow trout. Because of relatively good riparian habitat conditions and the diversity of fish life, the U.S. Environmental Protection Agency may designate portions of Alameda Creek as an Aquatic Diversity Management Area.
- 2.2 Calaveras Reservoir and stream water quality parameters tested -- temperature, dissolved oxygen, pH, hydrogen sulfide, copper, iron and manganese -- revealed no water quality conditions which would preclude improving downstream warm and cold water native fish populations.
- 2.3 Any summer flows released from Calaveras Reservoir would infiltrate the alluvium in the Sunol Valley and would migrate as subsurface flow into quarry pits adjacent to Alameda Creek in Sunol Valley.
- 2.4 Calaveras Reservoir spills an average of once every five to six years.
- 2.5 Facilities could be constructed to recapture all of the water released from Calaveras Reservoir for the proposed instream fishery and aquatic habitat beneficial uses. The best location for such a recapture facility is upstream from the quarries in Sunol Valley, in the vicinity of the SVWTP.

- 2.6 Establishment of an exclusively trout (cold water) fishery between Calaveras Dam and the SVWTP would not optimize habitat for existing native non-game fishes, which prefer warmer water temperatures.
- 2.7 The preferred fisheries management objective provides for a balance between an improved native trout fishery and maintenance of existing native non-game fish populations.
- 2.8 A variable portion of the required minimum flows for improved fish habitat will be supplied by unregulated runoff from Alameda Creek and accretion flow below Calaveras Dam. The maximum annual water release contemplated under this MOU is 6,300 acre feet, assuming no contribution from unregulated Alameda Creek flows.
- 2.9 If required, fish flow release schedules should be adjusted such that not less than 30,000 acre feet remain in Calaveras Reservoir through October, to provide sufficient cold water storage for water releases.
- 2.10 It is not feasible to establish a resident trout fishery a significant distance downstream of the SVWTP due to permeable streambed conditions and the naturally inadequate soil moisture required to support riparian vegetation, which would result in unsuitably warm stream temperatures for fish.

Section 3 -- Project Area

- 3.1 The geographic area covered by this MOU includes Alameda Creek between the Upper Alameda Diversion Dam and the proposed point of water recapture in the vicinity of the SVWTP, and Calaveras Creek between Calaveras Dam and the confluence of Calaveras and Alameda Creeks. A map showing the project area is attached as Appendix 1.
- 3.2 For fishery management purposes, Alameda and Calaveras Creeks below Calaveras Dam have been divided into two reaches, the "upper reach" and the "lower reach". The preferred alternative agreed to by CDFG and the SFPUC in the Alameda Creek Water Resources Study provides for a rate and schedule of water releases which maintains sufficiently cool summer water temperatures in the upper reach for native cold water game fish such as trout, with the water gradually warming as it enters the lower reach, improving conditions for native non-game fishes. The boundary between the upper and lower reaches shall be located two miles below the confluence of Alameda and Calaveras Creeks in Township 4 South, Range 1 East, section 11 at the intersection of the thalweg of Alameda Creek and the boundary between the EBRPD's Sunol Regional Park and

the SFPUC's watershed lands. This point was located by Global Positioning Satellite (GPS) on Thursday, April 24, 1997, at Latitude 37 degrees, 30 minutes, 57.41 seconds North, Longitude 121 degrees, 50 minutes, 4.10 seconds west. A map delineating the upper and lower reaches is attached as Appendix 1.

Section 4 -- Implementation of Preferred Alternative

- 4.1 **Timetable:** The SFPUC's consultant, B-E, will prepare a conceptual engineering report on the design and location of the water recapture facilities. A project level environmental impact report for the water release and recapture facilities will be prepared. Following completion of project level environmental review, the SFPUC may undertake construction of the water release and recapture facilities required to implement the preferred alternative. The best estimate of time of construction is during the fall of 1999.
- 4.2 **Recapture Facility -- Type:** A low dam with an inflatable rubber section is currently proposed. The dam would be deflatable to allow high flows to pass safely. Flows will be recaptured at this site using either a subsurface infiltration gallery or a screened streamside intake. The dam design and configuration shall provide for future upstream and downstream passage of anadromous fish. In the event that downstream barriers are modified in the future to provide for passage of anadromous fish, the SFPUC will utilize all means necessary to provide structural facilities for fish passage at the dam as approved by CDFG. Operation of the fish passage facility will follow procedures as agreed upon and documented in an operational MOU prepared and executed between the SFPUC and CDFG following the removal of downstream barriers to anadromous fish passage.
- 4.3 **Permits:** CDFG agrees to cooperate and support the SFPUC's efforts to obtain the necessary permits and approvals needed to implement the preferred alternative, including, but not limited to, Fish and Game Code section 1601 agreements; water quality certification under the Porter Cologne Act (Water Code section 13000 et. seq.) from the Bay Area Regional Water Quality Control Board; Clean Water Act section 404 permits from the U.S. Army Corps of Engineers; and any applicable local permits.
- 4.4 **Water Rights:** The preferred alternative constitutes a change in the point of diversion under the City's pre-1914 appropriative water rights for Calaveras Reservoir and the Sunol Filter Galleries. A portion of the water formerly diverted at Calaveras Reservoir through the 44 inch Calaveras Pipeline will be diverted downstream from Alameda Creek in the vicinity of the SVWTP at the new recapture facility; all or a portion of the Sunol Filter Gallery point of

diversion will be moved upstream to the new recapture facility. Pursuant to Water Code section 1706, a change in the point of diversion of a pre-1914 appropriative water right does not require the approval of the State Water Resources Control Board if others are not injured by the change. CDFG agrees that it will not protest or claim that the change in the SFPUC's points of diversion will result in injury to the fish and wildlife resources of the state under Water Code section 1706, if the amount of recaptured water does not exceed historic annual diversions at the Sunol Filter Galleries plus the amount of water released as part of the Calaveras Reservoir stream release and recapture program.

- 4.5 **CDFG Reports on Project Success:** CDFG shall write an initial assessment report on the accomplishments achieved in relation to the project goals, as outlined in the success criteria of this MOU, at the end of the third year of post-project monitoring. At the end of the fifth year of post-project monitoring, CDFG shall complete a final assessment report on the accomplishments achieved in relation to the project goals as outlined in the success criteria of this MOU. These assessment reports will be provided to the SFPUC and all other interested parties and agencies.
- 4.6 **Recreation Management/ Fishing Regulations:** Implementation of the “preferred alternative” will likely result in improved habitat conditions for native trout in the “upper reach” of the project area in Alameda Creek (Appendix 1). To assist in the establishment of a self-sustaining population of wild rainbow trout capable of supporting recreational sport fishing, CDFG shall submit a proposal to the Commission requesting that all streams within the project area be closed to sport fishing prior to project implementation. Upon successful establishment of a wild trout population in the upper reach of the project area to a level which the CDFG believes would sustain sport fishing recreation yet not be adversely impacted by angling, the CDFG shall submit a proposal to the Commission to reopen the upper reach of Alameda Creek to sport fishing with special “catch and release” angling regulations. CDFG shall propose appropriate angling regulations and shall consult with the SFPUC and EBRPD in advance of submitting any angling regulation change proposal to the Commission.

Section 5 -- Water Releases

- 5.1 **Water Releases:** Following the completion of project level environmental review and permitting approvals, the SFPUC may construct water system improvements needed to release water from Calaveras Reservoir and recapture this water in the vicinity of the SVWTP for consumptive use in the SFPUC service area. The SFPUC may reduce water releases during periods when unregulated runoff and accretions from Alameda Creek contribute to the target flows set forth below, and

in order to preserve water in Calaveras Reservoir for future release as provided in section 5.2 below. Following implementation of the preferred alternative, the SFPUC shall proceed with due diligence to make water releases in order to create the following flow regimes in Calaveras and Alameda Creeks:

A. Provide a 5-day running average flow of 5 cfs immediately below the confluence of Alameda and Calaveras Creeks from November 1 through January 14, with a minimum flow of not less than 4.5 cfs, except as modified by the ramping schedule set forth in Appendix 2.

B. Provide a 5-day running average spawning flow of 20 cfs immediately below the confluence of Alameda Creek and Calaveras Creek from January 15 through March 15, with a minimum flow of not less than 18 cfs. The SFPUC shall ramp up to and down from the 20 cfs average spawning flow according to the stream flow schedule as described in Appendix 2.

C. Provide a 5-day running average flow of 7 cfs immediately below the confluence of Alameda Creek and Calaveras Creek from March 16 to October 31, with a minimum flow of not less than 6.3 cfs, except as modified by the ramping schedule set forth in Appendix 2. The SFPUC shall also maintain existing base flow conditions in Calaveras Creek above its confluence with Alameda Creek during this period. These flows consist of approximately 0.5 cfs of seepage from Calaveras Dam.

D. The maximum quantity of water which the SFPUC may be called upon to release from Calaveras Reservoir under the terms of this MOU shall not exceed 6300 acre feet annually. CDFG and the SFPUC recognize that the volume and timing of water releases contemplated in sections 5.1 A through C above may be revised in response to pre- and post-project monitoring. However, the cumulative effect of any revisions to these water release schedules shall not cause the total volume of Calaveras Reservoir water releases to exceed 6300 acre feet per year.

- 5.2 **Reservoir Management:** The SFPUC shall maintain historical Calaveras Reservoir stratification conditions. The SFPUC shall review the water temperature profile in Calaveras Reservoir at least twice per month to ensure that favorable water temperatures for fish releases are maintained. The SFPUC shall use best efforts to maintain 30,000 acre feet of water in storage in late summer. The SFPUC may reduce spawning and rearing flows in order to preserve cold water releases from Calaveras Reservoir throughout the summer, after consulting with, and obtaining the approval of, CDFG.

- 5.3 **Adjustment of Water Releases and Storage Levels Due to Emergencies and Scheduled Maintenance:** Scheduled maintenance of water supply infrastructure, or emergency operating conditions, such as earthquake damage, unforeseen changes in source water quality, and emergency repair of storm damaged facilities, may require temporary changes to the water release and Calaveras Reservoir storage volumes agreed to in this MOU. Although the SFPUC will consult with CDFG and EBRPD prior to changing water releases during emergencies, the SFPUC reserves the right to increase, reduce or cease water releases under such emergency conditions. In the event that substantial changes in water releases or Calaveras Reservoir storage levels are required to perform scheduled maintenance activities, the SFPUC agrees to consult with and obtain the advance approval of CDFG prior to beginning construction activity.
- 5.4 **Adjustment of Flows During 5-year Monitoring Period:** Following the implementation of the water release regimes contemplated by this MOU, the SFPUC and CDFG agree to meet annually following the submission of the data summaries referenced in section 6.6, in order to negotiate appropriate revisions to water release schedules as may be required to meet the goals of the preferred alternative. Any changes in water releases provided for in this MOU shall be limited by (1) the SFPUC's ability to recapture the water released, taking into consideration such factors as the diversion capacity of the SFPUC's water recapture facility and SFPUC operational constraints; and (2) the maximum 6300 acre foot volume of Calaveras Reservoir water which is available to be released for fishery improvement purposes pursuant to the terms of this MOU.

Section 6 -- Monitoring Program

- 6.1 The SFPUC shall be responsible for obtaining the services of a qualified fishery biologist to perform the monitoring required by this MOU.
- 6.2 **Elements and Objectives:** The monitoring program will address specific elements relating to implementation of the preferred alternative as agreed to in the MOU. Specific elements to be addressed include stream flows, reservoir storage, temperature, water quality parameters, fish populations and fish habitat. The objective of the monitoring program is to demonstrate compliance with terms of the MOU relating to fishery resources of Alameda and Calaveras Creeks and to provide information useful in evaluating the need for any revisions to project operations or fisheries management to meet the goals of the preferred alternative.

- 6.3 **Schedule:** The overall monitoring program will be initiated within six months of the effective date of this MOU and will continue for a period of five years after implementation of the preferred alternative. There are two monitoring periods contemplated in this MOU: pre-project and post-project monitoring. The pre-project monitoring program will be initiated within six months of the effective date of this MOU and will continue until project implementation. Post-project monitoring will begin at the time of project implementation and will continue for a period of five years after implementation of the preferred alternative. Specific monitoring elements will be conducted at the sampling points, time intervals, and sampling frequency appropriate to the element as described below. Monitoring protocols for specific elements will be the same for pre-project and post-project monitoring periods.

6.4 **Water Quantity:**

A. Streamflow: Initial studies identified instream flows and water temperature as the principal factors limiting native trout populations in Alameda Creek. Flow characteristics were estimated that would achieve water temperature and habitat conditions to benefit native trout populations in upstream areas while maintaining suitable habitat for native warmwater fish species further downstream. Stream flow will be monitored under pre-project and post-project conditions to establish compliance with flow objectives. This information, together with other information on fish populations, habitat conditions, and water quality, will provide a basis for evaluating adjustment of flows if necessary to achieve project objectives.

Measurement Point:	Immediately below the confluence of Alameda and Calaveras Creeks
Measurement Parameter:	Stream flow
Measurement Interval:	Continuous, averaged on a daily basis using a USGS bubbler gage.
Success Criteria:	Maintain water releases as provided in sections 5.1 A through C above.

B. Reservoir Storage: Stream habitat conditions in Alameda Creek rely on adequate storage in Calaveras Reservoir. Temperature stratification of Calaveras Reservoir has historically provided a cold water pool when Calaveras Reservoir storage is more than 30,000 acre feet in the late summer. Reservoir conditions will be monitored to verify that SFPUC operations and implementation of the project maintain suitable levels of water storage. Reservoir monitoring will be implemented during the pre-

project monitoring period and will continue through the five year post-project monitoring period.

Measurement Point:	Calaveras Reservoir
Measurement Parameter:	Volume in storage (acre-feet)
Measurement Interval:	Weekly
Success Criteria:	Maintain not less than 30,000 acre feet in storage from July through late October.

6.5

Water Quality: Water quality monitoring will address water temperature, reservoir stratification, and other water quality parameters. The objectives of water quality monitoring are to address uncertainty in the relationship between stream flow and water temperature; to address the potential for water quality factors other than temperature and streamflow to limit fish populations; and to serve as a basis for determining revisions to water release schedules if required to meet the goals of the preferred alternative.

A. Stream Water Temperature: Project stream flow levels were determined in part to achieve suitable temperature conditions, based on results from a computer simulation model. Monitoring will be conducted to address uncertainties in the relation between streamflow and temperature and to verify that projected results are being obtained. Monitoring will begin during the pre-project monitoring period and continue through the five year post-project monitoring period.

Measurement Points:	Calaveras Creek below Calaveras Dam; Alameda Creek below the confluence with Calaveras Creek; Alameda Creek at the boundary between the upper and lower reaches identified in section 3.2; and Alameda Creek above the proposed SFPUC recapture facilities.
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Measurement Parameters:	Instantaneous stream temperature
Measurement Interval:	Every two hours
Success Criteria:	Stream temperature of 20 degrees C (68 degrees F) or less in Alameda Creek at the boundary between the upper and lower reaches identified in section 3.2 and monitoring points upstream of this location.

B. Reservoir Stratification: Project stream flow recommendations and the relationship between stream flow and temperature were based on historical stratification conditions in Calaveras Reservoir. Reservoir conditions should be monitored to verify that project implementation does not impair stratification. Monitoring will be completed during both the pre-project and the five year post-project monitoring periods.

Measurement Point:	Near Calaveras Reservoir intake tower
Measurement Parameters:	Thermal and dissolved oxygen profiles
Measurement Interval:	Once in April, June, August, September and October within five days of the calendar date of the previous month's monitoring.
Success Criteria:	Thermal stratification through the summer with release water temperature of 15 degrees C or less

C. Release Water Quality: Initial testing of water quality parameters revealed no water quality conditions which would preclude benefiting both warm and cold water native fish populations. However, these investigations were limited to a brief time interval. Further water quality monitoring will be conducted with the objective of verifying initial conclusions. Monitoring of water quality parameters will be conducted during both the pre-project and the five year post-project monitoring periods.

Measurement Points:	Calaveras Creek below Calaveras Dam (all parameters measured); Alameda Creek immediately below the confluence with Calaveras Creek (all parameters measured, except that turbidity readings at this location shall not be subject to the success criteria set forth below but will be measured for information purposes only)
Measurement Parameters:	Dissolved oxygen; pH; turbidity; hydrogen sulfide; copper; ammonia
Measurement Interval:	Once in April, June, July, August, October, and January, within five days of the calendar date of the previous month's monitoring.
Success Criteria:	Water quality objectives and criteria for applicable measurement parameters as defined in the 1995 Basin Plan promulgated by the San Francisco Bay Regional Water

Quality Control Board, attached as Appendix 3, except for turbidity. Turbidity levels at the sampling point in Calaveras Creek below Calaveras Dam shall not exceed the maximum turbidity level of water in Calaveras Reservoir by more than 50 NTU during periods when the the SFPUC is making controlled releases of water pursuant to the terms of this MOU.

- 6.6 **Biology:** Water releases and temperature objectives defined by the preferred alternative are meant to improve habitat conditions for native trout and other native fish species in Alameda Creek. Improved habitat conditions should result in increased distribution and abundance of native trout and maintenance of other native fish populations. It is also envisioned that a self reproducing wild population of rainbow trout will become established in the project area, and that CDFG will pursue management of a recreational fishery. Monitoring will be conducted to determine whether implementation of the preferred alternative results in anticipated benefits to fish populations and to serve as a basis for future management decisions such as fishing regulations or the determination of revisions to water release schedules if required to meet the goals of the preferred alternative.

A. Fish Population Abundance and Distribution: Potential benefits of the preferred alternative include greater abundance of trout in the project area and extended distribution of trout from present locations downstream in the upper reach defined in section 3.2. Existing populations of other native fish species downstream of Sunol Regional Park should be maintained. Monitoring will be conducted semi-annually during the pre-project and post-project periods to document changes in fish species composition, abundance and distribution. Standard quantitative methods for fish sampling will be used, e.g. Dolloff, Hankin & Reeves, "Basinwide Estimation of Habitat and Fish Populations in Streams", Gen. Tech. Report SE-83, USDA, 1993; and Flosi and Reynolds, "California Salmonid Stream Habitat Restoration Manual", CDFG Inland Fisheries Division, 1994.

Measurement Points: Representative habitats between the confluence of Calaveras and Alameda Creeks and the proposed water recapture facility

Measurement Parameters:	Relative abundance and catch-per-unit-effort by size class for each species at each sample site. Length, weight, and age characteristics for trout
Measurement Interval:	Once in early summer between June 10-20, and once in early fall between September 10-20
Success Criteria:	Increased abundance of trout in the “upper reach” of project area; a self-reproducing population of native trout including an abundance of trout greater than 6 inches in total length. The trout population shall contain a minimum of 3 viable age classes documenting an acceptable level of recruitment for size and type of stream. There shall also be similar or greater post-project abundance of native warmwater non-game fishes in the “lower reach” of the project area.

B. Trout Spawning: CDFG envisions that recreational angling may be opened in the project area when a self-reproducing wild population of rainbow trout becomes fully established. Monitoring will be conducted to determine the distribution of spawning activity within the project area and to estimate the relative size of spawning populations over time. Monitoring will begin during the pre-project monitoring period and continue through the 5-year post-project monitoring period.

Measurement Point:	Stream reach between the confluence of Calaveras and Alameda Creeks and proposed water recapture facility
Measurement Parameters:	Number of spawning trout and number of trout redds by location and survey date
Measurement Interval:	Twice per month at least two week intervals in January, February, and March
Success Criteria:	Suitable spawning sites used by trout: spawning population increases post-project

C. Fish Habitat: Initial studies identified stream flow and water temperature as the primary factors limiting native trout populations in Alameda Creek. The studies also identified secondary factors that may limit fish populations. Monitoring will be conducted to verify that stream flow under the preferred alternative results in improved fish habitat conditions and to identify any additional habitat factors that may limit fish populations. Standardized stream habitat survey techniques will be used, as defined in level 4 of the California Salmonid Stream Habitat Restoration Manual (Flossi and Reynolds, CDFG Inland Fisheries Division 1994).

Measurement Point:	Stream reach between the confluence of Calaveras and Alameda Creeks and proposed water recapture facility
Measurement Parameters:	Areal extent, depth, and cover characteristics of different stream habitat types (i.e. pool, riffle, etc.)
Measurement Interval:	Pre-Project: Once during each of three successive flow regimes between the following dates: January 20-30; September 15-25; and November 1-10. Post Project: Once during each of three successive flow regimes between the following dates: January 20-30; September 15-25; and November 1-10.
Success Criteria:	Improved habitat conditions for native trout in two mile stream reach below confluence of Calaveras and Alameda Creeks; maintained or improved habitat conditions for native fishes in lower reach.

6.7

Reports: Data summaries will be prepared for each monitoring season and made available by the following January of each year. The data summaries will include the names and qualifications of personnel conducting the study, the methods used, results, and discussions of any proposed modifications to the monitoring plan. A report will be prepared by March 1st following the first year of post-project monitoring. The purpose of this report will be to compare pre-project and post-project conditions after one year and to highlight any significant differences in conditions. A final report will be prepared by June 1st following the fifth year of post-project monitoring. The final report will summarize all results and compare pre-project and post-project fish populations, water quality, and habitat conditions.

- 6.8 **Interim Management:** An advisory committee will be formed to enhance information flow during the pre-project and post-project monitoring periods. Committee members will represent both CDFG and the SFPUC. Members from other groups such as the EBRPD, the U.S. Environmental Protection Agency, and California Trout may be included by mutual agreement of the SFPUC and CDFG. The advisory committee will receive information from the monitoring work as it becomes available. The advisory committee will consider development of improvement measures such as the introduction of trout from other sources. The advisory committee shall present recommendation(s) for project improvement to the SFPUC and CDFG. The implementation of any improvement measure(s) will be by mutual approval of CDFG and SFPUC. A separate liaison for the CDFG and the SFPUC will be identified to handle administration and amendment of this MOU.

Section 7 -- Term of MOU; Reservation of Rights; Amendment Process

- 7.1 **Term:** This MOU shall become effective upon signature by the respective parties. The parties recognize that environmental review must take place prior to implementation of the preferred alternative. The water release regimes contemplated herein are conditional upon the successful completion of environmental review under the California Environmental Quality Act. This MOU shall remain in force for as long as the SFPUC continues to operate Calaveras Dam and Reservoir, and the Upper Alameda Creek Diversion Dam.
- 7.2 **Reservation of Rights:** This MOU is entered into without prejudice to the rights and remedies of any party to the MOU.
- 7.3 **Amendments to MOU:** The terms and conditions of the MOU may be amended at any time provided such amendments are agreed to in writing by both parties to this MOU.
- 7.4 **Notifications:** All written notifications herein provided to be given or which may be given by either party to the other, shall be deemed to have been given when made in writing and deposited in the United States mail postage prepaid and addressed as follows:

To SFPUC: General Manager
San Francisco Public Utilities Commission
1155 Market Street, Fourth Floor
San Francisco, CA 94102

To CDFG: Regional Manager
Department of Fish and Game
Region 3
P.O. Box 47
Yountville, CA 94599

EXECUTION

IN WITNESS WHEREOF, each party hereto has caused this Memorandum of Understanding to be executed by an authorized official on the day and year set forth opposite their signature.

SAN FRANCISCO PUBLIC UTILITIES
COMMISSION

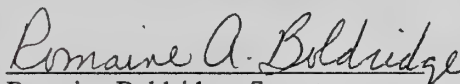
CALIFORNIA DEPARTMENT OF
FISH AND GAME

By:  7/30/97
ANSON B. MORAN Date
General Manager

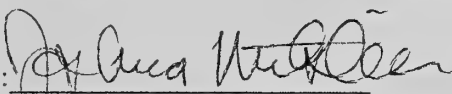
 7/25/97
California Department of Fish Date
and Game
P.O. Box 47
Yountville, CA 94599

Authorized by Public Utilities
Commission Resolution
No. 97-0200

Attest:


Romaine Boldridge, Secretary

APPROVED AS TO FORM:
LOUISE H. RENNE
City Attorney

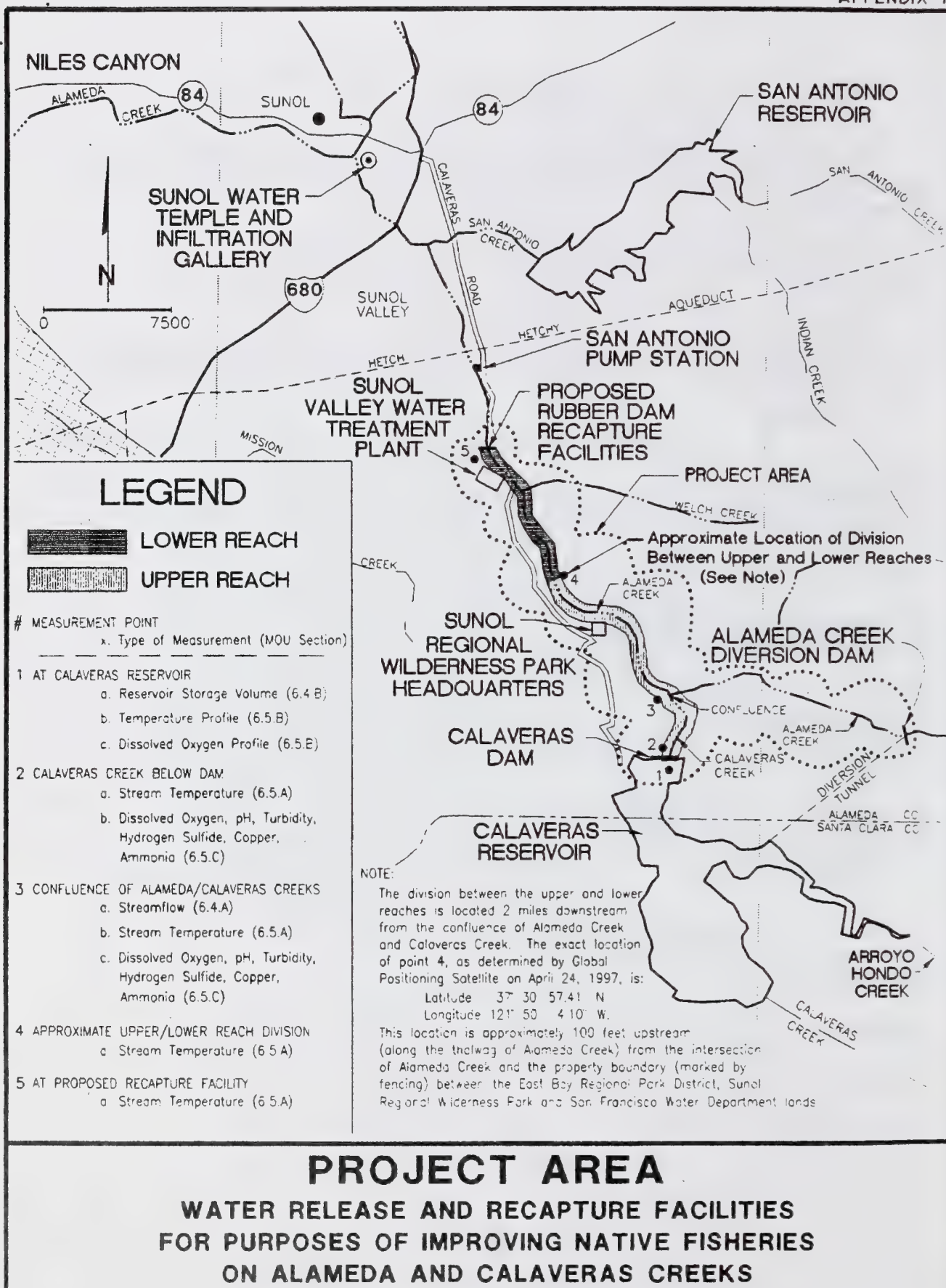
By: 
Joshua D. Milstein
Deputy City Attorney

CITY AND COUNTY OF SAN FRANCISCO
Board of Supervisors

Resolution no. _____

ATTEST:

Clerk of Said Board



DRAFT COPY ONLY

APPENDIX 2. PROPOSED STREAM FLOW RAMPING SCHEDULE FROM JANUARY 12 - APRIL 5 FOR ALAMEDA CREEK BELOW CALAVERAS RESERVOIR

Date	JANUARY		FEBRUARY		MARCH		APRIL		
	Flow (cfs)	AC-FT/Day	Flow (cfs)	AC-FT/Day	Flow (cfs)	AC-FT/Day	Flow (cfs)	AC-FT/Day	
1	5	10	20	40	20	40	10	20	
2	5	10	20	40	20	40	10	20	
3	5	10	20	40	20	40	10	20	
4	5	10	20	40	20	40	10	20	
5	5	10	20	40	20	40	7	14	
6	5	10	20	40	20	40	7	14	
7	5	10	20	40	20	40	7	14	
8	5	10	20	40	20	40	7	14	
9	5	10	20	40	20	40	7	14	
10	5	10	20	40	20	40	7	14	
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12	5	10	20	40	20	40	7	14	
13	10	20	20	40	20	40	7	14	
14	15	30	20	40	20	40	7	14	
15	20	40	20	40	20	40	7	14	
16	20	40	20	40	18	36	7	14	
17	20	40	20	40	18	36	7	14	
18	20	40	20	40	18	36	7	14	
19	20	40	20	40	18	36	7	14	
20	20	40	20	40	16	32	7	14	
21	20	40	20	40	16	32	7	14	
22	20	40	20	40	16	32	7	14	
23	20	40	20	40	16	32	7	14	
24	20	40	20	40	14	28	7	14	
25	20	40	20	40	14	28	7	14	
26	20	40	20	40	14	28	7	14	
27	20	40	20	40	14	28	7	14	
28	20	40	20	40	12	24	7	14	
29	20	40	20	40	12	24	7	14	
30	20	40	20	40	12	24	7	14	
31	20	40	20	40	12	24	7	14	

APPENDIX 3

3

WATER QUALITY OBJECTIVES

INTRODUCTION

The overall goals of water quality regulation are to protect and maintain thriving aquatic ecosystems and the resources those systems provide to society and to accomplish these in an economically and socially sound manner. California's regulatory framework uses water quality objectives both to define appropriate levels of environmental quality and to control activities that can adversely affect aquatic systems.

WATER QUALITY OBJECTIVES

There are two types of objectives: narrative and numerical. Narrative objectives present general descriptions of water quality that must be attained through pollutant control measures and watershed management. They also serve as the basis for the development of detailed numerical objectives.

Historically, numerical objectives were developed primarily to limit the adverse effect of pollutants in the water column. Two decades of regulatory experience and extensive research in environmental science have demonstrated that beneficial uses are not fully protected unless pollutant levels in all parts of the aquatic system are also monitored and controlled. The Regional Board is actively working towards an integrated set of objectives, including numerical sediment objectives, that will ensure the protection of all current and potential beneficial uses.

Numerical objectives typically describe pollutant concentrations, physical/chemical conditions of the water itself, and the toxicity of the water to aquatic organisms. These objectives are designed to represent the maximum amount of pollutants that can remain in the water column without causing any adverse effect on organisms using the aquatic system as habitat, on people consuming those organisms or water, and on other current or potential beneficial uses (as described in Chapter 2).

The technical bases of the region's water quality objectives include extensive biological, chemical, and physical partitioning information reported in the scientific literature, national water quality criteria, studies conducted by other agencies, and information gained from local environmental and discharge monitoring (as described in Chapter 6). The Regional Board recognizes that limited information exists in some cases, making it difficult to establish definitive numerical objectives, but the Regional Board believes its

conservative approach to setting objectives has been proper. In addition to the technical review, the overall feasibility of reaching objectives in terms of technological, institutional, economic, and administrative factors is considered at many different stages of objective derivation and implementation of the water quality control plan.

Together, the narrative and numerical objectives define the level of water quality that shall be maintained within the region. In instances where water quality is better than that prescribed by the objectives, the state Antidegradation Policy applies (State Board Resolution 68-16: Statement of Policy With Respect to Maintaining High Quality of Waters in California). This policy is aimed at protecting relatively uncontaminated aquatic systems where they exist and preventing further degradation.

When uncontrollable water quality factors result in the degradation of water quality beyond the levels or limits established herein as water quality objectives, the Regional Board will conduct a case-by-case analysis of the benefits and costs of preventing further degradation. In cases where this analysis indicates that beneficial uses will be adversely impacted by allowing further degradation, then the Regional Board will not allow controllable water quality factors to cause any further degradation of water quality. Controllable water quality factors are those actions, conditions, or circumstances resulting from human activities that may influence the quality of the waters of the state and that may be reasonably controlled.

QUICK INDEX	PAGE
Water Quality Objectives for:	
Ocean Waters	3-2
Surface Waters	3-2
Groundwaters	3-5
The Delta and Suisun Marsh	3-7
Alameda Creek Watershed	3-7

The Regional Board establishes and enforces waste discharge requirements for point and nonpoint source of pollutants at levels necessary to meet numerical and narrative water quality objectives. In setting waste discharge requirements, the Regional Board will consider, among other things, the potential impact on beneficial uses within the area of influence of the discharge, the existing quality of receiving waters, and the appropriate water quality objectives.

In general, the objectives are intended to govern the concentration of pollutant constituents in the main water mass. The same objectives cannot be applied at or immediately adjacent to submerged effluent discharge structures. Zones of initial dilution within which higher concentrations can be tolerated will be allowed for such discharges.

For a submerged buoyant discharge, characteristic of most municipal and industrial wastes that are released from submerged outfalls, the momentum of the discharge and its initial buoyancy act together to produce turbulent mixing. Initial dilution in this case is completed when the diluting wastewater ceases to rise in the water column and first begins to spread horizontally.

For shallow water submerged discharges, surface discharges, and nonbuoyant discharges, characteristic of cooling water wastes and some individual discharges, turbulent mixing results primarily from the momentum of discharge. Initial dilution, in these cases, is considered to be completed when the momentum-induced velocity of the discharge ceases to produce significant mixing of the waste, or the diluting plume reaches a fixed distance from the discharge to be specified by the Regional Board, whichever results in the lower estimate for initial dilution.

Compliance with water quality objectives may be prohibitively expensive or technically impossible in some cases. The Regional Board will consider modification of specific water quality objectives as long as the discharger can demonstrate that the alternate objective will protect existing beneficial uses, is scientifically defensible, and is consistent with the state Antidegradation Policy. This exception clause properly indicates that the Regional Board will conservatively compare benefits and costs in these cases because of the difficulty in quantifying beneficial uses.

These water quality objectives are considered necessary to protect the present and

potential beneficial uses described in Chapter 2 of this Plan and to protect existing high quality waters of the state. These objectives will be achieved primarily through establishing and enforcing waste discharge requirements and by implementing this water quality control plan.

OBJECTIVES FOR OCEAN WATERS

The provisions of the State Board's "Water Quality Control Plan for Ocean Waters of California" (Ocean Plan) and "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California" (Thermal Plan) and any revision to them will apply to ocean waters. These plans describe objectives and effluent limitations for ocean waters.

OBJECTIVES FOR SURFACE WATERS

The following objectives apply to all surface waters within the region, except the Pacific Ocean.

BACTERIA

Table 3-1 provides a summary of the bacterial water quality objectives and identifies the sources of those objectives. Table 3-2 summarizes U.S. EPA's water quality criteria for water contact recreation based on the frequency of use a particular area receives. These criteria will be used to differentiate between pollution sources or to supplement objectives for water contact recreation.

BIOACCUMULATION

Many pollutants can accumulate on particles, in sediment, or bioaccumulate in fish and other aquatic organisms. Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered.

BIOSTIMULATORY SUBSTANCES

Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses. Changes in chlorophyll a and associated phytoplankton communities follow complex dynamics that are sometimes associated with a discharge of biostimulatory substances. Irregular and extreme levels of chlorophyll a

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or phytoplankton blooms may indicate exceedance of this objective and require investigation.

COLOR

Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses.

DISSOLVED OXYGEN

For all tidal waters, the following objectives shall apply:

In the Bay:

Downstream of
Carquinez Bridge.....5.0 mg/l minimum
Upstream of
Carquinez Bridge.....7.0 mg/l minimum

For nontidal waters, the following objectives shall apply:

Waters designated as:

Cold water habitat.....7.0 mg/l minimum
Warm water habitat.....5.0 mg/l minimum

The median dissolved oxygen concentration for any three consecutive months shall not be less than 80 percent of the dissolved oxygen content at saturation.

Dissolved oxygen is a general index of the state of the health of receiving waters. Although minimum concentrations of 5 mg/l and 7 mg/l are frequently used as objectives to protect fish life, higher concentrations are generally desirable to protect sensitive aquatic forms. In areas unaffected by waste discharges, a level of about 85 percent of oxygen saturation exists. A three-month median objective of 80 percent of oxygen saturation allows for some degradation from this level, but still requires a consistently high oxygen content in the receiving water.

FLOATING MATERIAL

Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.

OIL AND GREASE

Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect beneficial uses.

POPULATION AND COMMUNITY ECOLOGY

All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce significant alterations in population or community ecology or receiving water biota. In addition, the health and life history characteristics of aquatic organisms in waters affected by controllable water quality factors shall not differ significantly from those for the same waters in areas unaffected by controllable water quality factors.

pH

The pH shall not be depressed below 6.5 nor raised above 8.5. This encompasses the pH range usually found in waters within the basin. Controllable water quality factors shall not cause changes greater than 0.5 units in normal ambient pH levels.

SALINITY

Controllable water quality factors shall not increase the total dissolved solids or salinity of waters of the state so as to adversely affect beneficial uses, particularly fish migration and estuarine habitat.

SEDIMENT

The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Controllable water quality factors shall not cause a detrimental increase in the concentrations of toxic pollutants in sediments or aquatic life.

SETTLEABLE MATERIAL

Waters shall not contain substances in concentrations that result in the deposition of material that cause nuisance or adversely affect beneficial uses.

SUSPENDED MATERIAL

Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

SULFIDE

All water shall be free from dissolved sulfide concentrations above natural background levels. Sulfide occurs in Bay muds as a result of bacterial action on organic matter in an anaerobic environment.

Concentrations of only a few hundredths of a milligram per liter can cause a noticeable odor or be toxic to aquatic life. Violation of the sulfide objective will reflect violation of dissolved oxygen objectives as sulfides cannot exist to a significant degree in an oxygenated environment.

TASTES AND ODORS

Waters shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, that cause nuisance, or that adversely affect beneficial uses.

TEMPERATURE

Temperature objectives for enclosed bays and estuaries are as specified in the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays of California," including any revisions to the plan.

In addition, the following temperature objectives apply to surface waters:

- The natural receiving water temperature of inland surface waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses.
- The temperature of any cold or warm freshwater habitat shall not be increased by more than 5°F (2.8°C) above natural receiving water temperature.

TOXICITY

All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms. Detrimental responses include, but are not limited to, decreased growth rate and decreased reproductive success of resident or indicator species. There shall be no acute toxicity in ambient waters. Acute toxicity is defined as a median of less than 90 percent survival, or less than 70 percent survival, 10 percent of the time, of test organisms in a 96-hour static or continuous flow test.

There shall be no chronic toxicity in ambient waters. Chronic toxicity is a detrimental biological effect on growth rate, reproduction, fertilization success, larval development, population abundance, community composition, or any other relevant measure of the health of an organism, population, or community.

Chronic toxicity generally results from exposures to pollutants exceeding 96 hours. However, chronic toxicity may also be detected through short-term exposure of critical life stages of organisms.

As a minimum, compliance will be evaluated using the bioassay requirements contained in Chapter 4.

The health and life history characteristics of aquatic organisms in waters affected by controllable water quality factors shall not differ significantly from those for the same waters in areas unaffected by controllable water quality factors.

TURBIDITY

Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases from normal background light penetration or turbidity relatable to waste discharge shall not be greater than 10 percent in areas where natural turbidity is greater than 50 NTU.

UN-IONIZED AMMONIA

The discharge of wastes shall not cause receiving waters to contain concentrations of un-ionized ammonia in excess of the following limits (in mg/l as N):

Annual Median	0.025
Maximum, Central Bay (as depicted in Figure 2-5) and upstream.....	0.16
Maximum, Lower Bay (as depicted in Figures 2-6 and 2-7)	0.4

The intent of this objective is to protect against the chronic toxic effects of ammonia in the receiving waters. An ammonia objective is needed for the following reasons:

- Ammonia (specifically un-ionized ammonia) is a demonstrated toxicant. Ammonia is generally accepted as one of the principle toxicants in municipal waste discharges. Some industries also discharge significant quantities of ammonia.
- Exceptions to the effluent toxicity limitations in Chapter 4 of the Plan allow for the discharge of ammonia in toxic amounts. In most instances, ammonia will be diluted or degraded to a nontoxic state fairly rapidly. However, this does not occur in all cases, the South Bay being a notable example. The ammonia limit is recommended in order to preclude any build up of ammonia in the receiving water.

- A more stringent maximum objective is desirable for the northern reach of the Bay for the protection of the migratory corridor running through Central Bay, San Pablo Bay, and upstream reaches.

OBJECTIVES FOR SPECIFIC CHEMICAL CONSTITUENTS

Surface waters shall not contain concentrations of chemical constituents in amounts that adversely affect any designated beneficial use. Water quality objectives for selected toxic pollutants developed in 1986 for surface waters are given in Tables 3-3 and 3-4.

The Regional Board intends to work towards the derivation of site-specific objectives for the Bay-Delta estuarine system. Site-specific objectives to be considered by the Regional Board shall be developed in accordance with the provisions of the federal Clean Water Act, the State Water Code, State Board water quality control plans, and this Plan. These site-specific objectives will take into consideration factors such as all available scientific information and monitoring data and the latest U.S. EPA guidance, and local environmental conditions and impacts caused by bioaccumulation. Copper, mercury, PCBs, and selenium will be the highest priorities in this effort. Pending the adoption of site-specific objectives, the objectives in Tables 3-3 and 3-4 apply throughout the region.

Based on the concerns raised in the Regional Monitoring Program, pilot fish contamination study, cooperative striped bass study, and other studies, water quality objectives for aromatic hydrocarbons are also needed.

The South Bay below the Dumbarton Bridge is a unique, water-quality-limited, hydrodynamic and biological environment that merits continued special attention by the Regional Board. Site-specific water quality objectives are absolutely necessary in this area for two reasons. First, its unique hydrodynamic environment dramatically affects the environmental fate of pollutants. Second, potentially costly nonpoint source pollution control measures must be implemented to attain any objectives for this area. The costs of those measures must be factored into economic impact considerations by the Regional Board in adopting any objectives for this area. Nowhere else in the region will nonpoint source economic considerations have such an impact on the attainability of objectives. Therefore, for this area, the objectives contained in Tables 3-3 and 3-4 will be considered

guidance only, and should be used as part of the basis for site-specific objectives.

Programs described in Chapter 4 will be used to develop site-specific objectives. Ambient conditions shall be maintained until site-specific objectives are developed.

CONSTITUENTS OF CONCERN FOR MUNICIPAL AND AGRICULTURAL WATER SUPPLIES

At a minimum, surface waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of constituents in excess of the maximum (MCLs) or secondary maximum contaminant levels (SMCLs) specified in the following provisions of Title 22 of the California Code of Regulations, which are incorporated by reference into this plan: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, Table 64444-A (Organic Chemicals) of Section 64444, and Table 64449-A (SMCLs-Consumer Acceptance Limits) and 64449-B (SMCLs-Ranges) of Section 64449. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. Table 3-5 contains water quality objectives for municipal supply, including the MCLs contained in various sections of Title 22 as of the adoption of this plan.

At a minimum, surface waters designated for use as agricultural supply (AGR) shall not contain concentrations of constituents in excess of the levels specified in Table 3-6.

RADIOACTIVITY

Radionuclides shall not be present in concentrations that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life. Waters designated for use as domestic or municipal supply shall not contain concentrations of radionuclides in excess of the limits specified in Table 4 of Section 64443 (Radioactivity) of Title 22 of the California Code of Regulations, which is incorporated by reference into this Plan. This incorporation is prospective, including future changes to the incorporated provisions as the changes take effect (see Table 3-5).

OBJECTIVES FOR GROUNDWATERS

Groundwater objectives consist primarily of narrative objectives combined with a limited number of numerical objectives. Additionally, the Regional Board will establish basin-

and/or site-specific numerical groundwater objectives as necessary. For example, the Regional Board has groundwater basin-specific objectives for the Alameda Creek watershed above Niles to include the Livermore-Amador Valley as shown in Table 3-7.

The maintenance of existing high quality of groundwater (i.e., "background") is the primary groundwater objective.

In addition, at a minimum, groundwaters shall not contain concentrations of bacteria, chemical constituents, radioactivity, or substances producing taste and odor in excess of the objectives described below unless naturally occurring background concentrations are greater.

BACTERIA

In groundwaters with a beneficial use of municipal and domestic supply, the median of the most probable number of coliform organisms over any seven-day period shall be less than 1.1 MPN/100 mL (based on multiple tube fermentation technique; equivalent test results based on other analytical techniques as specified in the National Primary Drinking Water Regulation, 40 CFR, Part 141.21 (f), revised June 10, 1992, are acceptable).

ORGANIC AND INORGANIC CHEMICAL CONSTITUENTS

All groundwaters shall be maintained free of organic and inorganic chemical constituents in concentrations that adversely affect beneficial uses. To evaluate compliance with water quality objectives, the Regional Board will consider all relevant and scientifically valid evidence, including relevant and scientifically valid numerical criteria and guidelines developed and/or published by other agencies and organizations (e.g., U.S. EPA, the State Water Resources Control Board, California Department of Health Services, U.S. Food and Drug Administration, National Academy of Sciences, Cal/EPA Office of Environmental Health Hazard Assessment, U.S. Agency for Toxic Substances and Disease Registry, Cal/EPA Department of Toxic Substances Control, and other appropriate organizations.)

At a minimum, groundwaters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of constituents in excess of the maximum (MCLs) or secondary maximum contaminant levels (SMCLs) specified in the following provisions of Title 22 of the California Code of

Regulations, which are incorporated by reference into this plan: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, and Table 64444-A (Organic Chemicals) of Section 64444. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

Groundwaters with a beneficial use of agricultural supply shall not contain concentrations of chemical constituents in amounts that adversely affect such beneficial use. In determining compliance with this objective, the Regional Board will consider as evidence relevant and scientifically valid water quality goals from sources such as the Food and Agricultural Organizations of the United Nations; University of California Cooperative Extension, Committee of Experts; and McKee and Wolf's "Water Quality Criteria," as well as other relevant and scientifically valid evidence. At a minimum, groundwaters designated for use as agricultural supply (AGR) shall not contain concentrations of constituents in excess of the levels specified in Table 3-6.

Groundwaters with a beneficial use of freshwater replenishment shall not contain concentrations of chemicals in amounts that will adversely affect the beneficial use of the receiving surface water.

Groundwaters with a beneficial use of industrial service supply or industrial process supply shall not contain pollutant levels that impair current or potential industrial uses.

To assist dischargers and other interested parties, the Central Valley Regional Board's staff has compiled many numerical water quality criteria from other appropriate agencies and organizations in its staff report, "A Compilation of Water Quality Goals." This staff report is updated regularly to reflect changes in these numerical criteria.

RADIOACTIVITY

At a minimum, groundwaters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the maximum contaminant levels (MCLs) specified in Table 4 (Radioactivity) of Section 64443 of Title 22 of the California Code of Regulations, which is incorporated by reference into this plan. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

TASTE AND ODOR

Groundwaters designated for use as domestic or municipal supply (MUN) shall not contain taste- or odor-producing substances in concentrations that cause a nuisance or adversely affect beneficial uses. At a minimum, groundwaters designated for use as domestic or municipal supply shall not contain concentrations in excess of the secondary maximum contaminant levels (Secondary MCLs) specified in Tables 64449-A (Secondary MCLs-Consumer Acceptance Limits) and 64449-B (Secondary MCLs-Ranges) of Section 64449 of Title 22 of the California Code of Regulations, which is incorporated by reference into this plan. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

OBJECTIVES FOR THE DELTA AND SUISUN MARSH

The objectives contained in the State Board's "Water Quality Control Plan for the Sacramento-San Joaquin Delta and Suisun Marsh" and any revisions thereto shall apply to the waters of the Sacramento-San Joaquin Delta and Suisun Marsh.

OBJECTIVES FOR ALAMEDA CREEK WATERSHED

The water quality objectives contained in Table 3-7 apply to the surface and groundwaters of the Alameda Creek watershed above Niles.

Wastewater discharges that cause the surface water limits in Table 3-7 to be exceeded may be allowed if they are part of an overall waterwastewater resource operational program developed by those agencies affected and approved by the Regional Board.

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S A N F R A N C I S C O B A Y R E G I O N 3-7

TABLE 3-1 WATER QUALITY OBJECTIVES FOR COLIFORM BACTERIA^a

BENEFICIAL USE	FECAL COLIFORM (MPN /100ML)	TOTAL COLIFORM (MPN/100ML)
Water Contact Recreation	log mean < 200 90th percentile < 400	median < 240 no sample > 10,000
Shellfish Harvesting ^b	median < 14 90th percentile < 43	median < 70 90th percentile < 230 ^c
Non-contact Water Recreation ^d	mean < 2000 90th percentile < 4000	
Municipal Supply: - Surface Water ^e - Groundwater	log mean < 20	log mean < 100 < 1.1 ^f

NOTES:

- a. Based on a minimum of five consecutive samples equally spaced over a 30-day period.
b. Source: National Shellfish Sanitation Program.
c. Based on a five-tube decimal dilution test or 300 MPN/100 ml when a three-tube decimal dilution test is used.
d. Source: Report of the Committee on Water Quality Criteria, National Technical Advisory Committee, 1968.
e. Source: DOHS recommendation.
f. Based on multiple tube fermentation technique; equivalent test results based on other analytical techniques, as specified in the National Primary Drinking Water Regulation, 40 CFR, Part 141.21(f), revised June 10, 1992, are acceptable.

TABLE 3-2 U.S. EPA BACTERIOLOGICAL CRITERIA FOR WATER CONTACT RECREATION^{1,2} (IN COLONIES PER 100 ML)

	FRESH WATER		SALT WATER
	ENTEROCOCCI	E. COLI	ENTEROCOCCI
Steady State (all areas)	33	126	35
Maximum at:			
- designated beach	61	235	104
- moderately used area	89	298	124
- lightly used area	108	406	276
- infrequently used area	151	576	500

NOTES:

1. The criteria were published in the Federal Register, Vol. 51, No. 45 / Friday, March 7, 1986 / 8012 - 8016. The Criteria are based on:
(a) Cabelli, V.J. 1983. Health Effects Criteria for Marine Recreational Waters. U.S. EPA, EPA 600/1-80-031, Cincinnati, Ohio, and
(b) Dufour, A.P. 1984. Health Effects Criteria for Fresh Recreational Waters. U.S. EPA, EPA 600/1-84-004, Cincinnati, Ohio.
2. The U.S. EPA criteria apply to water contact recreation only. The criteria provide for a level of protection based on the frequency of usage of a given water contact recreation area. The criteria may be employed in special studies within this region to differentiate between pollution sources or to supplement the current coliform objectives for water contact recreation.

QUALITY CONTROL PLAN 1995

TABLE 3-3 WATER QUALITY OBJECTIVES FOR TOXIC POLLUTANTS FOR SURFACE WATERS WITH SALINITIES GREATER THAN 5 PPT^{a,b}
(ALL VALUES IN UG/L)

COMPOUND	4-DAY AVERAGE ^c	1-HR AVERAGE ^c	24-HR AVERAGED	INSTANTANEOUS MAXIMUM ^c
Arsenic	36.0	69.0		
Cadmium	9.3	43.0		
Chromium (VI) ^e	50.0	1100.0		
Copper		f		
Cyanide		5.0		
Lead	5.6	140.0		
Mercury	0.025	2.1		
Nickel ^g			7.1	140.0
Selenium				
Silver				2.3
Tributyltin ^h				
Zinc			58.0	170.0
PAHs ⁱ			15.0	

NOTES:

a. These objectives shall apply to all estuarine waters within the region, according to the salinity threshold, except for the South Bay below Dumbarton Bridge.

b. The values reported in this table are derived from the 1980 and 1984 U.S. EPA Ambient Water Quality Criteria for salt water and fresh water (unless otherwise specified) and were adopted by the Board in 1986. In 1992, the Regional Board adopted a more inclusive set of objectives reflecting more recent technical information; this set of objectives had been developed and adopted as part of the statewide Inland Surface Waters and Enclosed Bays and Estuaries Plan and was ruled invalid by a court decision in 1993. The U.S. EPA is expected to promulgate final water quality standards for California in late 1995. The national standards will then apply to all planning, monitoring, NPDES permitting, enforcement, and compliance programs conducted under the Clean Water Act within the state.

c. Source: U.S. EPA 1984.

d. Source: U.S. EPA 1980.

e. This objective may be met as total chromium.

f. The current U.S. EPA criterion is 2.9 ug/l. However, copper toxicity varies with the complexing capacity of specific receiving waters, and background concentrations in the Bay typically vary from 1 to 4 ug/l. The Regional Board conducted scientific studies on Bay waters between 1986 and 1992 and determined that 4.9 ug/l was a more appropriate value for a site-specific objective, given U.S. EPA's derivation method. U.S. EPA is reviewing that method as part of its national rulemaking for California water quality standards. A site-specific criterion for copper is urgently needed.

g. The current U.S. EPA criterion is 8.3 ug/l (4-day average).

h. Tributyltin is a compound used as an antifouling ingredient in marine paints and toxic to aquatic life in low concentrations (<1 ppb). Based on technical information, a value of 0.005 ug/l (30-day average) would be protective of human health.

i. U.S. EPA water quality criteria indicate that 0.031 ug/l in both fresh water and salt water is protective of human health, based on setting the acceptable lifetime risk for cancer at the 10⁻⁶ risk level. PAHs are those compounds identified by EPA Method 610.

TABLE 3-4 WATER QUALITY OBJECTIVES FOR TOXIC POLLUTANTS FOR SURFACE WATERS WITH SALINITIES LESS THAN 5 PPT^{a,b}

(ALL VALUES IN UG/L)

COMPOUND	4-DAY AVERAGE ^c	1-HR AVERAGE ^c	24-HR AVERAGE ^d	INSTANTANEOUS MAXIMUM ^d
Arsenic	190.0	360.0		
Cadmium	e	e		
Chromium (VI) ^f	11.0	16.0		
Copper ^g	6.5	9.2		
Cyanide	5.2	22.0		
Lead	h	h		
Mercury	0.025 ⁱ	2.4		
Nickel	j	j	56.0	1100.0
Selenium				
Silver ^k				1.2
Tributyltin ^l				
Zinc	m	m	58.0	170.0
PAHs ⁿ				

NOTES:

- a. These objectives shall apply to all estuarine and inland surface waters within the region where the salinity is less than 5 ppt, except for the South Bay below Dumbarton Bridge.
- b. The values reported in this table are derived from the 1980 and 1984 U.S. EPA Ambient Water Quality Criteria for salt water and fresh water (unless otherwise specified) and were adopted by the Regional Board in 1986. In 1992, the Regional Board adopted a more inclusive set of objectives reflecting more recent technical information; this set of objectives had been developed and adopted as part of the statewide Inland Surface Waters and Enclosed Bays and Estuaries Plan and was ruled invalid by a court decision in 1993. The U.S. EPA is expected to promulgate final water quality standards for the California in late 1996. The national standards will then apply to all planning, monitoring, NPDES permitting, enforcement, and compliance programs conducted under the Clean Water Act within the state.
- c. Source: U.S. EPA 1984.
- d. Source: U.S. EPA 1980.
- e. The objectives for cadmium and other noted metals are expressed by formulas where $H = \ln$ (hardness) as CaCO_3 in mg/L. The four-day average objective for cadmium is $e^{(0.7882 H - 3.497)}$. This is 1.1 $\mu\text{g/L}$ at a hardness of 100 mg/L as CaCO_3 . The one-hour average objective for cadmium is $e^{(1.128 H - 3.828)}$. This is 3.9 $\mu\text{g/L}$ at a hardness of 100 mg/L as CaCO_3 .
- f. This limit may be met as total chromium.
- g. The U.S. EPA water quality criteria for copper are hardness-dependent. The current objectives are equivalent to these criteria as calculated for 50 mg/L hardness as CaCO_3 . The four-day average EPA criterion for copper is $e^{(0.8646 H - 1.466)}$; the one-hour average criterion is $e^{(0.9422 H - 1.464)}$.
- h. The four-day average objective for lead is $e^{(1.2738 H - 4.705)}$. This is 3.2 $\mu\text{g/L}$ at a hardness of 100 mg/L as CaCO_3 . The one-hour average objective for lead is $e^{(1.2738 H - 1.466)}$. This is 81 $\mu\text{g/L}$ at a hardness of 100 mg/L as CaCO_3 .
- i. The U.S. EPA Water Quality Criterion for mercury is 0.012 $\mu\text{g/L}$, which is below the level of detection of 0.025 $\mu\text{g/L}$. An objective of 0.012 $\mu\text{g/L}$ is desirable, but attainment can only be determined at the level of detection.
- j. The U.S. EPA criteria for nickel are hardness-dependent; the 4-day average criterion is $e^{(0.846 H + 1.1045)}$, which is 158 $\mu\text{g/L}$ at a hardness of 100 mg/L as CaCO_3 . The 1-hour average is $e^{(0.846 H + 3.3812)}$, which is 1,419 $\mu\text{g/L}$ at a hardness of 100 mg/L as CaCO_3 .
- k. The U.S. EPA water quality criterion for silver is hardness-dependent. This objective is equivalent to these criteria as calculated for 50 mg/L hardness as CaCO_3 . The instantaneous maximum EPA criterion is $e^{(1.723 H - 4.52)}$.
- l. Tributyltin is a compound used as an antifouling ingredient in marine paints and toxic to aquatic life in low concentrations (<1 ppb). Based on technical information, values of 0.02 $\mu\text{g/L}$ (4-day average), 0.04 $\mu\text{g/L}$ (24-hour average), and 0.06 $\mu\text{g/L}$ (instantaneous maximum) would be protective of aquatic life.
- m. The U.S. EPA criteria for zinc are hardness-dependent; the 4-day average criterion is $e^{(0.8473 H - 0.7614)}$, which is 23 $\mu\text{g/L}$ at a hardness of 100 mg/L as CaCO_3 . The 1-hour average is $e^{(0.8473 H - 0.8604)}$, which is 21 $\mu\text{g/L}$ at a hardness of 100 mg/L as CaCO_3 .
- n. U.S. EPA water quality criteria indicate that 0.031 $\mu\text{g/L}$ in both fresh water and salt water is protective of human health, based on setting the acceptable lifetime risk for cancer at the 10^{-4} risk level. PAHs are those compounds identified by EPA Method 610.

TABLE 3-5 WATER QUALITY OBJECTIVES FOR MUNICIPAL SUPPLY

PARAMETER	OBJECTIVE (IN MG/L)	PARAMETER	OBJECTIVE (IN MG/L)
Physical:			
Color (units) ^a	15.0	Benzene ^h	0.001
Odor (number) ^a	3.0	Carbon Tetrachloride ^h	0.0005
Turbidity (NTU) ^a	5.0	Carbofuran ^h	0.018
pH ^b	6.5	Chlordane ^h	0.0001
TDS ^c	500.0	1,2-Dibromo-3-chloropropane ^h	0.0002
EC (mmhos/cm) ^c	0.9	1,2-Dichlorobenzene ^h	0.6
Corrosivity	non-corrosive	1,4-Dichlorobenzene ^h	0.005
Inorganic Parameters:			
Aluminum ^d	1.0 ^d / 0.2 ^a	1,1-Dichloroethane ^h	0.005
Antimony ^d	0.006	1,2-Dichloroethane ^h	0.0005
Arsenic ^d	0.05	cis-1,2-Dichloroethylene ^h	0.006
Asbestos ^d	7 MFL ^e	trans-1,2-Dichloroethylene ^h	0.01
Barium ^d	1.0	1,1-Dichloroethylene ^h	0.006
Beryllium ^d	0.004	Dichloromethane ^h	0.005
Chloride ^c	250.0	1,2-Dichloropropane ^h	0.005
Cadmium ^d	0.005	1,3-Dichloropropene ^h	0.0005
Chromium ^d	0.05	Di (2-ethylhexyl) adipate ^h	0.4
Copper ^a	1.0	Di(2-ethylhexyl) phthalate ^h	0.004
Cyanide ^d	0.2	Ethylbenzene ^h	0.7
Fluoride ^f	0.8-1.79	Ethylene dibromide ^h	0.00005
Iron ^a	0.3	Glyphosate ^h	0.7
Lead ^b	0.05	Heptachlor ^h	0.00001
Manganese ^a	0.05	Heptachlor epoxide ^h	0.00001
Mercury ^d	0.002	Hexachlorobenzene ^h	0.001
Nickel ^d	0.1	Hexachlorocyclopentadiene ^h	0.05
Nitrate (as NO ₃) ^d	45.0	Molinate ^h	0.02
Nitrate + Nitrite (as N) ^d	10.0	Monochlorobenzene ^h	0.07
Nitrite (as N) ^d	1.0	Oxamyl ^h	0.2
Selenium ^d	0.05	Pentachlorophenol ^h	0.001
Silver ^b	0.05	Picloram ^h	0.5
Sulfate ^c	250.0	Polychlorinated Biphenyls ^h	0.0005
Thallium ^d	0.002	Simazine ^h	0.004
Zinc ^a	5.0	Styrene ^h	0.1
Organic Parameters:			
MBAS (Foaming agents) ^a	0.5	1,1,2,2-Tetrachloroethane ^h	0.001
Oil and grease ^b	none	Tetrachloroethylene ^h	0.005
Phenols ^b	0.001	Thiobencarb ^h	0.001
Trihalomethanes ^b	0.1	1,2,4-Trichlorobenzene ^h	0.07
Chlorinated Hydrocarbons:			
Endrin ^h	0.002	1,1,1-Trichloroethane ^h	0.2
Lindane ^h	0.0002	1,1,2-Trichloroethane ^h	0.005
Methoxychlor ^h	0.04	Trichloroethylene ^h	0.005
Toxaphene ^h	0.003	Trichlorofluoromethane ^h	0.15
2,3,7,8-TCDD (Dioxin) ^h	3 x 10 ⁻⁸	1,1,2-Trichloro-1,2,2-trifluoroethane ^h	1.2
2,4-D ^h	0.07	Toluene ^h	0.15
2,4,4-TP Silvex ^h	0.05	Vinyl chloride ^h	0.0005
Synthetics:			
Alachlor ^h	0.002	Xylenes (single or sum of isomers) ^h	1.75
Atrazine ^h	0.003	OBJECTIVE (IN pCi/l)	
Bentazon ^h	0.018	Radioactivity:	
Benzo(a)pyrene ^h	0.0002	Combined Radium-226 and Radium-228 ⁱ	5
Dalapon ^h	0.2	Gross Alpha Particle Activity ^j	15
Dinoseb ^h	0.007	Tritium ⁱ	20,000
Diquat ^h	0.02	Strontium-90 ^j	8
Endothal ^h	0.1	Gross Beta Particle Activity ^j	50
		Uranium ⁱ	20

NOTES:

- Secondary Maximum Contaminant Levels as specified in Table 64449-A of Section 64449, Title 22 of the California Code of Regulations, as of June 19, 1995.
- Table III-2, 1986 Basin Plan.
- Secondary Maximum Contaminant Levels as specified in Table 64449-B of Section 64449, Title 22 of the California Code of Regulations, as of June 19, 1995. (Levels indicated are "recommended" levels. Table 64449-B contains a complete list of upper and short-term ranges.)
- Maximum Contaminant Levels as specified in Table 64431-A (Inorganic Chemicals) of Section 64431, Title 22 of the California Code of Regulations, as of June 19, 1995.
- MFL = million fibers per liter; MCL for fibers exceeding 10 µm in length.
- Fluoride objectives depend on temperature.
- A complete list of optimum and limiting concentrations is specified in Table 64431-B of Section 64431, Title 22 of the California Code of Regulations, as of June 19, 1995.
- Maximum Contaminant Levels as specified in Table 64444-A (Organic Chemicals) of Section 64444, Title 22 of the California Code of Regulations, as of June 19, 1995.
- Maximum Contaminant Levels as specified in Table 4 (Radioactivity) of Section 64443, Title 22 of the California Code of Regulations, as of December 22, 1988.
- Includes Radium-226 but excludes Radon and Uranium.

TABLE 3-6 WATER QUALITY OBJECTIVES FOR AGRICULTURAL SUPPLY ^a**(IN MG/L)**

PARAMETER	THRESHOLD	LIMIT	LIMIT FOR LIVESTOCK WATERING
Physical:			
pH	5.5-8.3	4.5-9.0	
TDS			10,000.0
EC (mmhos/cm)		0.2-3.0	
Inorganic Parameters:			
Aluminum	5.0	20.0	5.0
Arsenic	0.1	2.0	0.2
Beryllium	0.1	0.5	
Boron	0.5	2.0	5.0
Chloride	142.0	355.0	
Cadmium	0.01	0.5	0.05
Chromium	0.1	1.0	1.0
Cobalt	0.05	5.0	1.0
Copper	0.2	5.0	0.5
Fluoride	1.0	15.0	2.0
Iron	5.0	20.0	
Lead	5.0	10.0	0.1
Lithium		2.5 ^b	
Manganese	0.2	10.0	
Molybdenum	0.01	0.05	0.5
Nickel	0.2	2.0	
NO ₃ + NO ₂ (as N)	5.0	30 ^c	100.0
Selenium		0.02	0.05
Sodium adsorption ratio (adjusted) ^d	3.0	9.0	
Vanadium	0.1	1.0	0.1
Zinc	2.0	10.0	25

NOTES:

- a. For an extensive discussion of water quality for agricultural purposes, see "A Compilation of Water Quality Goals," Central Valley Regional Water Quality Control Board, May 1993.
- b. For citrus irrigation, maximum 0.075 mg/l.
- c. For sensitive crops. Values are actually for NO₃-N + NH₄-N.
- d. Adjusted SAR = [Na / (Ca + Mg) 1/2] [1 + (8.4 - pHc)] where pHc is a calculated value based on total cations, 2 Ca + Mg + CO₃ + HCO₃, in me/L. Exact calculations of pHc can be found in "Guidelines for Interpretation of Water Quality for Agriculture" prepared by the Univ. of California Cooperative Extension.

Appendix I

Mitigation Measure Consistency with WSIP PEIR

Appendix I: Mitigation Measure Consistency with WSIP Program EIR

The Water System Improvement Program (WSIP) Program Environmental Impact Report (PEIR) mitigation measures were each evaluated for their applicability to the proposed Calaveras Dam Replacement Project (CDRP). In some cases, the mitigation measures of the PEIR were relevant to the proposed project. The following table shows the results of this evaluation. The first column presents the mitigation measures from the PEIR that address impacts of construction of WSIP facilities and operation of the WSIP system. The second column shows the applicability of the measure to the CDRP, indicated by “Y” for yes (including instances where a mitigation measure from the PEIR has been incorporated into the CDRP project description and no further mitigation is required) and “N” for no. When the CDRP project description has incorporated a WSIP PEIR mitigation measure, or a project-specific mitigation measure has been developed that would achieve a comparable reduction in impact as the PEIR measure, the third column indicates how the PEIR mitigation measure has been applied to the project.

The WSIP PEIR also includes some mitigation measures for system operation that are not applicable to the CDRP because they are designed for operation of a specific portion of the WSIP system that is not affected by the CDRP, for example, the Westside Groundwater Basin in San Francisco. These measures are not included in the table.

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Land Use		
Measure 4.3-2, Facility Siting Studies: Conduct project-specific facility siting studies for non-SFPUC land and implement these studies’ recommendations to avoid or minimize impacts on existing land uses.	N	Not applicable; All activities would be confined to SFPUC-owned land.
Measure 4.3-4a, Architectural Design: Design permanent new, aboveground facilities to be compatible with existing visual character of the site and surrounding area.	N	Not applicable; Operation of project facilities is a less-than-significant impact because, like the existing dam, the replacement dam itself would not be visually dominant in the overall context of the landscape given its lowered position in the landscape and the expansiveness of views from the Sunol Wilderness. No mitigation measures are required.
Measure 4.3-4b, Landscaping Plans: Prepare and implement landscaping plans to restore (recontour, revegetate, landscape) sites to preconstruction conditions. Monitor landscape plantings.	N	Not applicable; No substantial existing landscaping; vegetation is primarily natural. Implementation of policies of the <i>Alameda Watershed Management Plan</i> , calling for site and vegetation restoration (i.e., Action Des 5A: contour to mimic surrounding landforms; and Action Veg 4: revegetated graded areas) would occur as part of the proposed project. In addition, this EIR identifies the need for implementation of Vegetation and Wildlife Mitigation Measure 5.4.2, Habitat Restoration Measures.

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Measure 4.3-4c, Landscape Screens: Include new plantings and landscape berms to screen views of new structures and equipment from scenic roads.	N	Not applicable; Scale of project precludes screening. Screening devices would be ineffective as mitigation because of the extent and position of the dam work areas in relation to the Sunol Wilderness. If screening of construction areas were employed in this wilderness setting, the screening devices would themselves become a visually intrusive presence.
Measure 4.3-4d, Minimize Tree Removal: Minimize or avoid the removal of trees that screen existing and proposed WSIP facility sites; implement tree replacement plan.	N	Not applicable; As stated above, screening devices would be ineffective as mitigation. However, Mitigation Measure 5.4.3 would compensate for habitat losses by creating, restoring, and enhancing oak woodlands and savannah at the San Antonio Mitigation Area, and riparian forest at the South Calaveras and San Antonio Mitigation Areas.
Measure 4.3-5, Reduce Lighting Effects: Use cut-off shields and nonglare fixture design, direct lighting onsite and downward, and prevent use of highly reflective building materials or finishes.	N	Not applicable; Project site has minimal exterior lighting which would not change substantially as a result of proposed project.
Geology		
Measure 4.4-1, Quantified Landslide Analysis: Avoid sites with landslide hazards; where they cannot be avoided, conduct site-specific slope stability analyses and implement recommendations.	Y	Geotechnical studies already conducted; Recommendations for landslide stabilization to be implemented as part of project design; See Section 4.8, Geology, Soils, and Seismicity.
Measure 4.4-4, Subsidence Monitoring Program: Monitor subsidence and implement corrective actions as warranted.	Y	Project design includes subsidence monitoring.
Measure 4.4-9, Characterize Extent of Expansive and Corrosive Soil: Characterize presence of expansive/corrosive soils; implement recommendations.	Y	Soils studies already conducted; Corrosive soils not present. See Section 4.8, Geology, Soils, and Seismicity.
Hydrology		
Measure 5.4.1-2, Diversion Tunnel Operation: The SFPUC will implement operational criteria for the diversion dam which will require that water not needed to fill Calaveras Reservoir would be released to Alameda Creek below the diversion dam.	Y	Proposed project operations include operational criteria for the diversion tunnel that would implement this PEIR mitigation measure (see Subsection 3.6.3).

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Measure 4.5-2, Site-Specific Groundwater Analysis and Identified Measures: Conduct project-specific analysis of dewatering and implement measures to ensure that groundwater resources beneficial uses of groundwater not adversely affected.	Y	Analysis of dewatering conducted (see Section 4.6, Hydrology). The effects of construction dewatering on shallow groundwater would be temporary and localized and there would be no potential impacts to groundwater supply. Upon completion of the dam and restoration of the higher reservoir, seepage would be restored and groundwater recharge and transmission would resume in the alluvium downstream of the dam. No mitigation is required.
Measure 4.5-4a, Flood Flow Protection Measures: Preclude exposure of stockpiled soils, hazardous materials, and construction materials to flood flows.	Y	Project Measure 5.7.1
Measure 4.5-4b, Site-Specific Flooding Analysis and Identified Measures: Implement design measures to preclude projects from causing flooding or damage from redirected flood flows.	N	Analysis of flood zones conducted; No facilities would be located in flood zones. In addition, by maintaining an operational outlet during the rainy season and drawing down the reservoir to minimal operating levels during construction, the risk of flooding during construction would be less than significant and no mitigation is required.
Measure 4.5-5, Stormwater Treatment and Groundwater Monitoring: If treated stormwater is used to maintain Lake Merced water levels, monitor surface water and groundwater quality in the vicinity of Lake Merced. Identify and implement corrective actions (e.g., treatment).	N	Not applicable; Project does not impact water levels in or near Lake Merced or use treated stormwater to maintain lake levels.
Measure 4.5-6, Appropriate Source Controls and Site Design Measures: If a WSIP project will affect jurisdictional wetlands, implement source control and site design measures to ensure compliance with applicable water quality criteria and goals and protect the beneficial uses of the receiving water.	Y	Project Measure 5.7.1
Biology		
Measure 4.6-1a, Wetlands Assessment: Wetland scientist will determine whether wetlands could be affected by the project, and if so, perform a wetland delineation and develop mitigation.	Y	Wetlands assessments have been performed and findings incorporated into project design and mitigation. See Section 4.4, Vegetation and Wildlife, and Section 5.4, Vegetation and Wildlife Mitigation Measures.

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Measure 4.6-1b, Compensation for Wetlands and Other Biological Resources: If a WSIP project will affect jurisdictional wetlands, implement avoidance measures, restoration procedures, and compensatory creation or enhancement to ensure no net loss of wetland extent or function. Compensate for sensitive riparian and upland habitats supporting key special-status species. Obtain permits for each project and comply with applicable regulations addressing sensitive habitats and species. The Habitat Reserve Program is an alternative for implementing offsite habitat compensation.	Y	Project Measure 5.4.3 revises this measure specific to the CDRP impacts.
Measure 4.6-2, Habitat Restoration/Tree Replacement: Restore temporarily affected sensitive habitats. Replace trees designated as heritage trees (or similar local designation) consistent with requirements of local ordinances. Minimize loss of sensitive habitats by coordinating WSIP projects.	Y	Project Measure 5.4.2 revises this measure specific to CDRP impacts. No heritage or other locally designed trees were found. However, Mitigation Measure 5.4.3 would compensate for habitat losses by creating, restoring, and enhancing oak woodlands and savannah at the San Antonio Mitigation Area, and riparian forest at the South Calaveras and San Antonio Mitigation Areas.
Measure 4.6-3a, Protection Measures During Construction for Key Special-Status Species and Other Species of Concern: Where key special-status species and other species of concern are potentially present, implement general practice measures (preconstruction surveys, worker awareness program, environmental inspector, minimization of habitat loss).	Y	Project Measure 5.4.1 revises this measure specific to CDRP impacts. Worker awareness training is included under this project mitigation measure.
Measure 4.6-3b, Standard Mitigation Measures for Key Special-Status Plants and Animals: Implement measures to reduce impacts on key special-status species. <i>See below for specific species and corresponding sub-PEIR mitigation number.</i>		Project Measures 5.4.1 and 5.4.2 adapt this measure specific to CDRP impacts and the special status species identified.
Invertebrates		
Valley Elderberry Longhorn Beetle	N	Project not located within habitat of this species
Vernal Pool Crustaceans (Vernal pool fairy shrimp; Conservancy fairy shrimp; Vernal pool tadpole shrimp)	N	No vernal pools located on project site
Bay Checkerspot Butterfly; Callippe Silverspot Butterfly	Y	Project Measure 5.4.1 and 5.4.2

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Fish		
Central Valley fall- and late-fall run Distinct Population Segment (DPS) Chinook salmon; Central Valley DPS steelhead; Green sturgeon Southern District DPS; Central Coast DPS Steelhead; Rainbow trout	Y	Measures to reduce impacts on resident rainbow trout included in Project (see Subsection 3.5.5, Fishery Protection). No other designated special status fish are found in the affected area. Project Measures 5.5.1, 5.5.5a, and 5.5.5b.
Reptiles and Amphibians		
California Red-Legged Frog; Foothill yellow-legged frog	Y	Project Measure 5.4.1 and 5.4.3
California Tiger Salamander	Y	Project Measure 5.4.1 and 5.4.3
San Francisco Garter Snake	N	Project not located within habitat of this species
Alameda Whipsnake	Y	Project Measure 5.4.1 and 5.4.3
Birds		
Swainson's Hawk	N	Project not located within habitat of this species
Western Burrowing Owl	Y	Project Measure 5.4.1
Raptors (including bald eagle)	Y	Project Measure 5.4.1
Least Bell's vireo	N	Project not located within habitat of this species
California Black Rail, California Clapper Rail	N	Project not located within habitat of this species
Western Snowy Plover	N	Project not located within habitat of this species
Mammals		
Salt Marsh Harvest Mouse	N	Project not located within habitat of this species
San Joaquin Kit Fox	N	Project not located within habitat of this species
Riparian Woodrat	N	Project not located within habitat of this species
Plants		
Vernal Pool Plants (Succulent Owl's Clover; Hoover's Spurge; Colusa Grass; San Joaquin Valley Orcutt grass; Greene's Tuctoria; Hairy Orcutt Grass)	N	No vernal pools located on project site

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Riparian Plants		
Delta button-celery	N	Project not located within habitat of this species
Large-Flowered Fiddleneck	N	Project not located within habitat of this species
San Francisco Woolly Sunflower; Marin Western Flax; Fountain thistle	N	Project not located within habitat of this species
Measure 4.6-4, Pipeline and Water Treatment Plant Treated Water Discharge Restrictions: Design planned discharges from the WSIP pipelines and water treatment plants to natural water bodies to minimize impacts on riparian and aquatic resources and to avoid or minimize temperature effects on aquatic resources.	N	Project is not a pipeline or water treatment plant project
Measure 5.4.6-1, Compensation for Impacts on Terrestrial Biological Resources: The SFPUC will compensate for sensitive wetland, riparian, and upland habitats and habitats which support key special status species and other species of concern lost as a result of WSIP system operation.	Y	Project Measure 5.4.3
Measure 5.4.6-3, Operational Procedures for Calaveras Dam Releases: The SFPUC will manage releases from Calaveras Reservoir to mimic a more natural hydrologic regime in the creek for the benefit of terrestrial biological resources. The specifics of this mitigation measure will be determined as part of project-level CEQA review.	Y	Management of releases is included in Project (see Subsection 3.6.3)
Fisheries		
Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek: The SFPUC will develop and carry out an operations plan to release a minimum flow of approximately 10 cubic feet per second from the diversion dam and monitor the effects of the release on resident trout spawning and egg incubation. **If monitoring results for Measure 5.4.5-3a indicate the measure is unsuccessful, the SFPUC will implement Measure 5.4.5-3b	Y	Releases incorporated in project (see Subsection 3.6.5). Project Measures 5.5.1, 5.5.5a, and 5.5.5b,

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Measure 5.4.5-3b, Alameda Diversion Dam Restrictions or Fish Screens: If after 10 years the minimum release does not sustain the resident trout population, the SFPUC will either increase releases from the diversion dam or install a fish passage barrier on the diversion tunnel.		
Cultural		
Measure 4.7-1, Suspend Construction Work if Paleontological Resource is Identified: Suspend work and notify a qualified paleontologist when a paleontological resource is discovered at any of the project sites. The paleontologist will document the discovery as needed, evaluate the potential resource, and assess the significance of the find under CEQA criteria. Temporarily halt or divert excavation within 50 feet of a fossil find until the discovery is examined by a paleontologist. If avoidance is not feasible, the paleontologist will prepare an excavation plan.	Y	Project Measure 5.10.3
Measure 4.7-2a, Archaeological Testing, Monitoring, and Treatment of Human Remains: Determine if implementation of an archeological testing or archeological monitoring program or both is the appropriate strategy for avoidance of potential adverse effects on significant archaeological resources. Review any requirements approved by the State Historic Preservation Officer. Prepare an archeological testing plan, an archeological monitoring plan, final archeological resources report and, if applicable, a archeological data recovery plan. The treatment of human remains and of associated or unassociated funerary objects discovered during any soil-disturbing activity will comply with applicable state laws.	Y	Project Measure 5.10.1
Measure 4.7-2b, Accidental Discovery Measures: Distribute archaeological resource "ALERT" to contractors. If an archeological resource may be present within the project site, an archeological consultant will evaluate it and make a recommendation as to what action (e.g., preservation in situ) is warranted. The project sponsor will implement appropriate measures.	Y	Project Measure 5.10.2

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Measure 4.7-3, Protection of Historic Districts: A qualified historian will assess the city's water system facilities affected by WSIP facility projects for their potential contribution to a historic district. If a historic district would be affected by one or more proposed WSIP facility projects, develop and implement mitigation measures for effects with attention to the potential district as a whole. Should a historic district be identified at the project level, it should be recorded as such, using National/California Register criteria of significance. Document the district by completing the State of California Department of Parks and Recreation 523 forms and submit to the State Historic Preservation Officer.	N	Not applicable; Project is not located in a historic district
Measure 4.7-4a, Alternatives Identification and Resource Relocation: Identify feasible project alternatives to eliminate or reduce the need for demolition or removal of a historic resource to the greatest extent possible. If preservation of the affected historical resource at the current site is determined to be infeasible, the structure will, if feasible, be stabilized and relocated to other appropriate nearby sites. After relocation, the resource will be treated according to the Secretary of the Interior's <i>Standards for the Treatment of Historic Properties</i> . If the affected historical resource is to be demolished, consult with local historical societies and governmental agencies regarding salvage of materials for public information or reuse in other locations.	N	Not applicable; No historic resources present
Measure 4.7-4b, Historical Resources Documentation: Prepare documentation of historical resources prior to any construction work associated with demolition or removal. The appropriate level of documentation will be selected by a qualified professional who meets the standards for history, architectural history, and/or architecture (as appropriate) set forth by the Secretary of the Interior's <i>Professional Qualification Standards</i> (36 CFR 61) in consultation with a preservation specialist assigned by the San Francisco Planning Department and the local jurisdiction, if deemed appropriate by the Planning Department.	N	Not applicable; No historic resources present

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Measure 4.7-4c, Secretary of the Interior's Standards for Treatment of Historic Properties: Prepare materials describing and depicting the proposed project. Review the proposed project for compliance with the Secretary of the Interior's <i>Standards for the Treatment of Historic Properties</i> . If a project is determined to be inconsistent with the <i>Standards for the Treatment of Historic Properties</i> , pursue and implement redesign of the project such that consistency with the standards is achieved.	N	Not applicable; No historic resources present
Measure 4.7-4d, Historic Resources Survey and Redesign: Undertake a historic resources survey to identify and evaluate potential historical resources that may exist in the project's area of potential effect. If a survey identifies one or more historical resources, assess the impact the project may have on those historical resources. If the project will cause a substantial adverse change to a historical resource, assign a preservation specialist to review the proposed project for compliance with the Secretary of the Interior's <i>Standards for the Treatment of Historic Properties</i> . If the project is determined to be inconsistent with those standards, pursue and implement redesign of the project such that consistency with the standards is achieved.	N	Not applicable; No historic resources present
Measure 4.7-4e, Historic Resources Protection Plan: A qualified historian will prepare a plan that specifies procedures for protecting and monitoring historical resources during construction.	N	Not applicable; No historic resources present
Measure 4.7-4f, Preconstruction Surveys and Vibration Monitoring: Include geotechnical investigations if vibration-related impacts could affect historical resources. Follow recommendations of the final geotechnical reports. Conduct a preconstruction survey of existing conditions and monitor the adjacent buildings for damage during construction, if recommended.	N	Not applicable; No historic resources present

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Traffic		
Measure 4.8-1a, Traffic Control Plan Measures: Elements of the traffic control plan could include: circulation and detour plans, designated truck routes, sufficient staging area, access to driveways, use of standard construction specifications for controlling construction vehicle movements, restrictions on truck trips during peak morning and evening commute hours, lane closure restrictions, maintenance of alternate one-way traffic flow, detour signing, pedestrian and bicycle access and circulation, equipment and materials storage, construction worker parking, roadside safety protocols, considerations for sensitive land uses, coordination with local transit service providers, roadway repair, conformance with the state's <i>Manual of Traffic Controls for Construction and Maintenance Work Areas</i> .	Y	Project Measure 5.12.4a includes those features of Measure 4.8-1a that are relevant to the proposed project.
Measure 4.8-1b, Coordination of Individual Traffic Control Plans: In the event that more than one construction contract is issued for work along existing or new pipelines, and where construction could occur within and/or across multiple streets in the same vicinity, coordinate the traffic control plans in order to mitigate the impact of traffic disruption by including measures that address overlapping construction schedules and activities, truck arrivals and departures, lane closures and detours, and the adequacy of on-street staging requirements.	Y	Project Measure 5.12.4a
Measure 4.8-4, Accommodation of Displaced Public Parking Supply for Recreational Visitors: Include an additional measure in the traffic control plans to accommodate any anticipated visitor parking demand that would be displaced by proposed projects at public recreational facilities.	N	Not applicable; Project will not displace parking

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Air Quality		
Measure 4.9-1a, SJVAPCD Dust Control Measures: Include San Joaquin Valley Air Pollution Control District (SJVAPCD) Basic Control Measures in contract specifications for all construction sites. Include SJVAPCD Enhanced Control Measures in contract specifications when required to mitigate significant PM ₁₀ impacts. Include SJVAPCD Additional Control Measures in contract specifications for construction sites that are large in area, located near sensitive receptors, or which for any other reason warrant additional emissions reductions. Include SJVAPCD Rule 9510, Indirect Source Review, Section 6.1, Construction Equipment Emissions in contract specifications for any project subject to discretionary approval by a public agency that ultimately results in the construction of a new building, facility, or structure or reconstruction of a building, facility, or structure for the purpose of increasing capacity or activity and also involving 9,000 square feet of space.	N	Not applicable; Project is not located in SJVAPCD
Measure 4.9-1b, SJVAPCD Exhaust Control Measures: Include SJVAPCD Exhaust Control Measures in contract specifications, where applicable, for heavy-duty equipment to limit exhaust emissions within the San Joaquin Region.	N	Not applicable; Project is not located in SJVAPCD
Measure 4.9-1c, BAAQMD Dust Control Measures: For projects in the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions, include Bay Area Air Quality Management District (BAAQMD) Basic Control Measures in contract specifications for all construction sites. Include BAAQMD Enhanced Control Measures in contract specifications for sites over four acres. Include BAAQMD Optional Control Measures in contract specifications for sites that are large in area, located near sensitive receptors, or which for any other reason warrant additional emissions reductions.	Y	Project Measure 5.13.1a
Measure 4.9-1d, BAAQMD Exhaust Control Measures: For projects in the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions, include BAAQMD Exhaust Control Measures to limit exhaust emissions, where applicable.	Y	Project Measure 5.13.1b

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Measure 4.9-2a, Health Risk Screening or Use of Soot Filters: Complete a health risk screening if truck volumes associated with a particular project along a particular haul route exceed 40,000 truck trips over the entire construction period. If a potentially significant impact is indicated, complete a site-specific health risk assessment. Consider diesel particulate matter (DPM) emission rates in separate project-level analysis at the time of construction. Develop a mitigation program based on the site-specific health risk assessment implementing methods of reducing DPM emission or exposure to a less-than-significant level.	Y	Health Risk Screening Analysis has been performed (see Impact 4.13.3 in Section 4.13, Air Quality). Project Measures 5.13.2a and 5.13.2b reduce significant impacts to less-than-significant levels.
Measure 4.9-2b, Vacate SFPUC Land Managers' Residences in Sunol Valley: Vacate the two SFPUC Land Managers' residences in the Sunol Valley during construction of the Calaveras Dam or SVWTP – Treated Water Reservoirs projects or complete a health risk screening (and, if warranted, a health risk assessment) to determine health risks at these residences from either of these two projects.	Y	Project includes vacating watershed keeper's residence adjacent to project site. Health Risk Screening Assessment performed, showing less-than-significant impact at watershed keeper's residence on Calaveras Road.
Measure 4.9-3, Tunnel Gas Odor Control: Add water scrubbers and appropriate chemicals to tunnel ventilation systems if odorous gases become a nuisance odor problem (i.e., odor complaints are received).	Y	The California Tunnel Safety Orders (TSO), set forth in 8 CCR Subchapter 20, Article 8, require the California Department of Industrial Relations, Division of Industrial Safety (DIS) to classify all tunnels or portions of tunnels. The TSO specify ventilation requirements for all tunnels and require an emergency plan for all tunnel operations that includes maps, ventilation controls, firefighting equipment, rescue procedures, evacuation plans, and communications. For potentially gassy tunnels, the orders specify monitoring requirements during construction. It is the responsibility of the owner and contractor to comply with the requirements of the TSO, but a Cal/OSHA representative would conduct a pre-job safety walk prior to the start of construction and would conduct periodic inspection of the tunneling operations to confirm compliance.

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Noise/Vibration		
Measure 4.10-1a, Noise Controls: For all WSIP projects located within 500 feet of any noise-sensitive receptors, implement appropriate noise controls to reduce daytime construction noise levels to meet the 70-dBA daytime speech interference criterion to the extent feasible. For all WSIP projects involving nighttime construction and located within 3,000 feet of any noise-sensitive receptors, implement appropriate noise controls to maintain noise levels at or below any applicable ordinance nighttime noise limits or the 50-dBA nighttime sleep interference criterion to the extent feasible.	Y	Project Measure 5.14.1 revised this measure specific to CDRP impacts
Measure 4.10-1b, Vacate SFPUC Caretaker's Residence at Tesla Portal: Vacate caretaker's residence at Tesla Portal during construction of the Advanced Disinfection and Tesla Portal Disinfection Station projects as well as those portions of the San Joaquin Pipeline System and Rehabilitation of Existing San Joaquin Pipelines projects located at Tesla Portal.	N	Not applicable; Project is not located near Tesla Portal
Measure 4.10-2a, Limit Hourly Truck Volumes: Haul and delivery truck routes for all WSIP projects will, to the extent feasible, avoid local residential streets and follow local designated truck routes. Total project-related haul and delivery truck volumes on any particular haul truck route will be limited to 80 trucks per hour.	N	Not applicable; Access to project area is not on typical local residential streets
Measure 4.10-2b, Restrict Truck Operations: Prohibit haul and delivery trucks from operating within 200 feet of any residential uses during the nighttime hours. For receptors beyond 200 feet from a haul route, limit noise levels to the 50-dBA sleep interference criterion at the closest receptor.	Y	Project Measure 5.14.1 and Cumulative Measure 5.17.1
Measure 4.10-2c, Vacate SFPUC Land Manager's Residence: Vacate Land Manager's residence adjacent to Alameda East Portal during offsite truck operations associated with the New Irvington Tunnel project, if truck operations occur during the nighttime hours (10 p.m. to 7 a.m.) and are estimated to exceed the 50-dBA sleep interference criterion at this residence.	N	Not applicable; Measure is specific to New Irvington Tunnel project

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Measure 4.10-3a, Vibration Controls to Prevent Cosmetic or Structural Damage: Incorporate restrictions into all contract specifications (primarily for sheetpile driving, pile driving, or tunnel construction activities), whereby surface vibration will be limited to 0.2 inches per second (in/sec) peak particle velocity (PPV) for continuous vibration (e.g., vibratory equipment and impact pile drivers) and 0.5 in/sec PPV for controlled detonations at the closest receptors to ensure that cosmetic or structural damage does not occur.	N	Not applicable; The extent of vibration that would be generated by controlled blasting or pile driving would be below accepted thresholds. Vibration impacts would be less than significant and no mitigation is required.
Measure 4.10-3b, Limit Vibration Levels at or Below Vibration Perception Threshold: Maintain vibration levels at or below the vibration perception threshold at adjacent properties to the extent feasible during nighttime. If vibration complaints are received, operational adjustments will be made to reduce vibration annoyance effects.	N	Not applicable; No nearby occupied residences
Measure 4.10-3c, Limit Tunnel-Related Detonation to Daylight Hours: Limit controlled detonation associated with tunnel construction to daylight hours, Monday through Saturday.	Y	Project Measure 5.14.2; Blasting restricted to daylight hours Monday through Friday (see Subsection 3.5.1.9, Blasting, in Chapter 3, Project Description).
Services/Utilities		
Measure 4.11-1a, Notify Neighbors of Potential Utility Service Disruption: Notify residents and businesses in project area of potential utility service disruption two to four days in advance of construction.	N	Not applicable; Project would not affect local utilities
Measure 4.11-1b, Locate Utility Lines Prior to Excavation: Locate overhead and underground utility lines prior to excavation work.	N	Not applicable; Project would not affect local utilities
Measure 4.11-1c, Confirmation of Utility Line Information: Find the exact location of underground utilities by safe and acceptable means. Confirm information regarding the size, color, and location of existing utilities before construction activities commence.	N	Not applicable; Project would not affect local utilities
Measure 4.11-1d, Safeguard Employees from Potential Accidents Related to Underground Utilities: While any excavation is open, protect, support, or remove underground utilities as necessary to safeguard employees.	N	Not applicable; Project would not affect local utilities

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Measure 4.11-1e, Notify Local Fire Departments: Notify local fire departments any time damage to a gas utility results in a leak or suspected leak, or whenever damage to any utility results in a threat to public safety.	N	Not applicable; Project would not affect local utilities
Measure 4.11-1f, Emergency Response Plan: Develop an emergency response plan in the event of a leak or explosion prior to commencing construction activities.	N	Not applicable; Project would not affect local utilities
Measure 4.11-1g, Prompt Reconnection of Utilities: Promptly reconnect any disconnected utility lines.	N	Not applicable; Project would not affect local utilities
Measure 4.11-1h, Coordinate Final Construction Plans with Affected Utilities: Coordinate final construction plans and specifications with affected utilities.	N	Not applicable; Project would not affect local utilities
Measure 4.11-2, Waste Reduction Measures: Incorporate into contract specifications for each WSIP project the requirement to obtain any necessary waste management permits prior to construction and to comply with conditions of approval attached to project implementation.	N	Not applicable; Project would not generate substantial amount of solid waste requiring off-site waste disposal
Recreation		
Measure 4.12-1, Coordination with Golf Course/Recreational Facility Managers: Coordinate with managers of golf courses or other recreational facilities directly affected by pipeline construction to minimize adverse impacts on golfers and other recreational users.	N	Not applicable; Project would not directly affect recreational facilities
Measure 4.12-2, Appropriate Siting of Proposed Facilities: Locate WSIP project facilities on park and recreation properties in consultation with park planning staff to minimize the direct loss of recreation and play space and to minimize inconvenience to park and recreation users.	N	Not applicable; Project not located on park or recreation properties

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Agriculture		
Measure 4.13-1a, Supplemental Noticing and Soil Stockpiling: For the San Joaquin Pipeline projects (San Joaquin System and Rehabilitation of Existing San Joaquin Pipeline), stockpile and replace topsoil in mapped areas of Prime and Unique Farmland and Farmland of Statewide Importance that would be temporarily disturbed by pipeline construction, unless other actions are required under specific agreements with individual landowners.	N	Not applicable; Measure specific to San Joaquin Pipeline projects. No Prime Farmland, Unique Farmland, or Farmland of Statewide Importance would be disturbed.
Measure 4.13-1b, Avoidance or Soil Stockpiling: Minimize any potential impacts on agricultural lands in the Sunol Valley by avoiding these resources wherever possible. Where this is not possible, stockpile, replace, and hydroseed topsoil to prevent erosion, unless other actions are required as a result of contracts affecting use of the property or under specific agreements with individual landowners.	N	Not applicable; Impact on agricultural land is limited to temporary reduced acreage for grazing during construction (see Project Measure 5.7.1, regarding erosion prevention).
Measure 4.13-2, Siting Facilities to Avoid Prime Farmland: Avoid areas identified as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. If avoidance is not feasible, adopt a permanent set-aside for an equivalent acreage of similarly valued farmland in the area.	N	Not applicable; No Prime Farmland, Unique Farmland, or Farmland of Statewide Importance would be disturbed.
Hazards		
Measure 4.14-1a, Site Health and Safety Plan: For all projects where the site assessment indicates the potential to encounter hazardous materials, prepare a site health and safety plan identifying the chemicals present, potential health and safety hazards, monitoring, soils-handling methods, appropriate personnel protective equipment, and emergency response procedures.	Y	Project Measures 5.9.2a and 5.9.2b
Measure 4.14-1b, Materials Disposal Plan: For all projects where the site assessment indicates the potential to encounter hazardous materials in the soil, prepare a materials disposal plan that specifies the disposal method and approved disposal site for the soil.	Y	Project Measure 5.9.1d

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Measure 4.14-1c, Coordination with Property Owners and Regulatory Agencies: Based on regulatory agency file reviews, assess the potential to encounter unacceptable levels of hazardous materials at known environmental cases, for construction activities to cause groundwater plume migration or interfere with ongoing remediations at known environmental cases, and for increased water levels in reservoirs or lakes to inundate known environmental cases. Modify construction or remediation activities.	Y	Hazardous materials analyses completed; See Subsection 4.9.1, Hazards and Hazardous Materials Setting. Potential impacts on the trichloroethene groundwater plume at the Calaveras Test Site and on Calaveras Reservoir water quality would be less than significant and no further mitigation is required.
Measure 4.14-2, Health Risk Screening and Airborne Asbestos Monitoring Plan: For tunneling projects where soil or rock may contain naturally occurring asbestos, conduct a health risk screening assessment to identify acceptable levels of asbestos in tunnel emissions. Prepare an airborne asbestos monitoring plan for approval by the BAAQMD.	Y	Project Measure 5.9.1b and 5.9.2
Measure 4.14-5, Hazardous Building Materials Surveys and Abatement: For all WSIP projects involving demolition or renovation of existing facilities, perform a hazardous building materials survey for each structure prior to demolition or renovation activities. If any friable asbestos-containing materials, lead-containing materials, or hazardous components of building materials are identified, implement adequate abatement practices prior to demolition or renovation.	Y	Project Measure 5.9.5
Energy		
Measure 4.15-2, Incorporation of Energy Efficiency Measures: Consistent with the Energy Action Plan II priorities for reducing energy usage, ensure that energy-efficient equipment is used in all WSIP projects. Prepare a repair and maintenance plan for each facility to minimize power use. Evaluate the potential for use of renewable energy resources.	N	Not applicable; CDRP energy use would not be substantially different from existing use

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Collective Impacts (Consider these to be part of Cumulative mitigation measures)		
Measure 4.16-1a, Construction Coordination at Irvington Portal: If construction schedules of multiple WSIP projects occurring at and near Irvington Portal coincide or overlap, the SFPUC will coordinate with construction contractor(s) and neighbors to minimize disturbance of residents in the adjacent neighborhood to minimize disturbance of residents in the adjacent neighborhood to the extent practicable. Such coordination will need to balance the duration of construction with the magnitude of construction related impacts on the same sensitive receptors.	N	Not applicable; Project does not take place at or near the Irvington Tunnel
Measure 4.16-4a, Bioregional Habitat Restoration Measures: Address the following bioregional effects and implement conservation principles when implementing habitat compensation mitigation required for individual WSIP facility projects: compound impacts on functional units of habitat as WSIP projects simplify vegetation structure and increase “edge” (the boundary between two different habitats); increased habitat impacts due to the spread of weedy, non-native plant species; genetic diversity impacts on small populations; impacts on wildlife movement due to habitat fragmentation; suppression of natural disturbance regimes; and reduced population recovery opportunities from stochastic events.	Y	Conservation principles included in Project Measure 5.4.3 (Vegetation and Wildlife) are consistent with the conservation principles required when implementing habitat conservation measures under the PEIR mitigation measure 4.16-4a.
Measure 4.16-4b, Coordination of Construction Staging and Access: Coordinate construction contractor(s) to minimize surface disturbance when construction schedules for WSIP projects affecting the same areas overlap.	N	Not applicable; With implementation of project design features that avoid and minimize impacts to biological resources and implementation of Project Measures 5.4.1, 5.4.2, and 5.4.3, the PEIR Collective/Cumulative Measure is not required.
Measure 4.16-6a, SFPUC WSIP Projects Construction Coordinator: Identify a qualified construction coordinator to coordinate project-specific traffic control plans; develop a public information campaign to inform the public of construction activities, detour routes, and alternate routes; work with local and regional agencies to pursue additional traffic mitigation measures and incorporate such measures into the project-specific traffic control plans.	Y	Project Measure 5.12.4a

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Measure 4.16-6b, Combined San Joaquin Traffic Control Plan: Develop a San Joaquin Traffic Control Plan that coordinates the project-specific traffic control plans and identifies additional measures (consistent with the standards of San Joaquin County, Stanislaus County, and Caltrans) to minimize the combined impacts of multiple WSIP project construction traffic on I-580, Chrisman Road, and Vernalis Road.	N	Not applicable; No project facilities located within San Joaquin or Stanislaus counties
Measure 4.16-6c, Combined Sunol Valley Traffic Control Plan: Develop a Sunol Valley Traffic Control Plan that coordinates the project-specific traffic control plans and identifies additional measures (consistent with the standards of Alameda County and Caltrans) to minimize the impacts of construction traffic on Calaveras Road and I-680.	Y	Project Measure 5.12.4a
Measure 4.16-7a, Dust and Exhaust Control Measures for All WSIP Projects: Require implementation of Air Quality Measures 4.9-1a thru 4.9-1d for all WSIP projects to address collective construction-related air quality impacts.	Y	Project Measure 5.13.1a and b
Measure 4.16-7b, Health Risk Screening or Use of Soot Filters for All Projects in the San Joaquin and Sunol Valley Regions: Require Measure 4.9-2a for all WSIP projects in the San Joaquin and Sunol Valley Regions to address collective DPM impacts. When this requirement is applied to the New Irvington Tunnel project, it will be applied to both the Sunol Valley and Fremont tunnel portals, taking into account truck traffic from other WSIP projects in the vicinity of both portals.	Y	Health Risk Screening Analysis has been performed (see Impact 4.13.3 in Section 4.13, Air Quality); Project Measures 5.13.2a and 5.13.2b reduce significant impacts to less-than-significant levels.
Measure 4.16-7c, Vacate SFPUC Land Managers' Residences for All Projects in the Sunol Valley Region: Require Measure 4.9-2b for all WSIP projects in the Sunol Valley Region to address collective DPM impacts.	Y	Residence at Calaveras Reservoir to be vacated as part of project (see Subsection 3.4.2.4, in Chapter 3, Project Description).

PEIR Mitigation Measures	Applicable to Proposed Project? (Y/N)	Notes (Explain why mitigation measure is either not applicable to proposed project or a different measure is more suitable)
Measure 4.16-8a, Limiting Hourly Truck Volumes and Restricting Truck Operations on Haul Routes for Multiple WSIP Projects: Apply Measures 4.10-2a and 4.10-2b to total haul and delivery truck volumes attributable to all WSIP projects on any particular haul truck route (including haul routes in the Tesla Portal, Irvington Portal, and Lower Crystal Springs Dam vicinities as well as haul routes in the San Francisco Region) to address collective truck-related noise impacts.	Y	Cumulative Measure 5.17.1
Measure 4.16-8b, Vacate Land Manager's Residence for All Projects in Sunol Valley Region: To address collective noise impacts, vacate Land Manager's residence adjacent to Alameda East Portal during construction truck operations associated with all WSIP projects in this region if collective daytime truck volumes exceed the 70-dBA speech interference criterion or nighttime truck volumes exceed the 50-dBA sleep interference criterion.	N	See Cumulative Measure 5.17.1 related to nighttime truck noise
Cumulative Effects		
Measure 4.17-6, SFPUC WSIP Projects Construction Coordinator – Other Agencies: The SFPUC WSIP construction coordinator designated in accordance with Measure 4.16-6a will also consider the effects of any traffic generated by SFPUC maintenance activities and other SFPUC projects; and coordinate with Caltrans, other county agencies, and local jurisdictions regarding construction of other private and public development projects so as to minimize traffic impacts on local access roads.	Y	Project Measure 5.12.4a
Measure 4.17-8, Coordination of Truck Traffic on Local Streets: The SFPUC WSIP construction coordinator designated in Measure 4.17-6 will also be responsible for coordinating truck traffic generated on these same streets by SFPUC maintenance activities and other SFPUC projects so that SFPUC-related truck noise increases are maintained at or below threshold levels specified in Measures 4.10-2a and 4.10-2b to the extent feasible.	Y	Project Measure 5.12.4a

Appendix J

Calaveras Dam Replacement Project: Future Steelhead Cumulative Impacts Analysis – Central California Coast Steelhead

Technical Memorandum: Calaveras Dam Replacement Project: Future Cumulative Impacts Analysis – Central California Coast Steelhead

Date: September 25, 2009
To: Chris Kern, MEA
Kelley Capone and Craig Freeman, SFPUC
From: Chris Fitzer and Mark Winsor, EDAW / Turnstone Joint Venture
Distribution: Jill Blanchard, Tim Ramirez, and Dan Wade, SFPUC

1 INTRODUCTION AND APPROACH

1.1 Introduction

The purpose of this technical memorandum is to present an analysis of the potential effects of the Calaveras Dam Replacement Project (CDRP) on Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) distinct population segment (DPS). This analysis was conducted to assess effects on steelhead that may result from operation of the proposed CDRP under a future baseline scenario in which the species is assumed to be present in the upper Alameda Creek watershed. This memorandum reviews and presents the following information:

- ▶ introduction, CDRP primary and extended study areas, summary overview of the proposed project, and information on the methodological approach used in the memorandum (Section 1);
- ▶ steelhead life history strategy characteristics and associated habitat requirements (Section 2);
- ▶ existing and projected future habitat conditions throughout the primary and extended study areas (Section 3); and
- ▶ analysis of the project's contribution to potential future cumulative impacts on steelhead (Section 4).

See the CDRP environmental impact report (EIR) Chapter 3, "Project Description," for a full description of the proposed project and Section 4.5, "Fisheries and Aquatic Habitats," and Section 4.6, "Hydrology," for a discussion on environmental setting and impacts for these resource areas.

Information relating to steelhead recovery in the Alameda Creek watershed has been developed in previous and ongoing studies (Gunther et al. 2000; McBain and Trush 2008). This information has been synthesized and summarized here. As of the date of this memorandum, native anadromous steelhead runs do not have access to Alameda Creek due to migration barriers at and upstream of the Bay Area Rapid Transit (BART) weir (downstream of the mouth of Niles Canyon) in the lower reach of Alameda Creek; however, a run of anadromous steelhead will be restored once ongoing efforts to remedy the barriers to passage and migration are successful in the future and surface flows for successful in- and out-migration are provided. For purposes of conducting this analysis of future baseline conditions for steelhead, this technical memorandum assumes certain reasonably foreseeable actions (see Section 3.2) will be implemented that would result in a future baseline scenario where steelhead have access to the watershed.

1.2 Study Areas

For purposes of analysis, two discreet study areas have been identified, a primary and extended study area. They consist of all aquatic resources that could be directly or indirectly affected by operation of the proposed dam and associated facilities. See EIR Figure 3.1 for a map of the project location, Figure 3.2 for a map of the Calaveras Dam vicinity, Figure 4.6.1 for a map of the Alameda Creek drainage and sub-drainage areas, and Figure 4.5.1 for a map of the fisheries and aquatic habitat primary and extended study areas and study sub-reaches.

1.2.1 Primary Study Area

Stream reaches downstream of Calaveras Dam and related facilities including the Alameda Creek Diversion Dam (ACDD) could be most affected by operation of the proposed project and are therefore included in the primary study area. This area includes Calaveras Creek from the existing dam downstream to the confluence with Alameda Creek and Alameda Creek downstream from the existing ACDD to Arroyo de la Laguna. The ACDD diverts water from Alameda Creek to Calaveras Reservoir and is an integral part of the existing and proposed project operations. The ACDD is located on Alameda Creek approximately 3 miles upstream from the Calaveras Creek confluence. Above the ACDD, Alameda Creek is considered hydrologically unimpaired. Downstream of Calaveras Dam, the primary study area includes the segment of Alameda Creek terminating at the Arroyo de la Laguna confluence. The primary study area also includes the Calaveras Reservoir impoundment area, which encompasses the area that would be directly affected by restoring the pool elevation of the reservoir after the proposed replacement dam is constructed. The impoundment area also encompasses portions of tributaries (e.g., Arroyo Hondo, upper Calaveras Creek) that could be inundated when the reservoir is at maximum capacity, but would otherwise not be altered permanently by construction.

1.2.2 Extended Study Area

The extended study area includes the segment of the Alameda Creek from the Arroyo de la Laguna confluence downstream to the San Francisco Bay. Compared to existing conditions, the operations of the proposed Calaveras Dam and ACDD would have diminished influence on flows and related aquatic habitat parameters downstream of Arroyo de la Laguna in comparison to those resulting from operation of other water projects in the watershed. Such water projects with greater effects than the CDRP in the extended study area include Del Valle Reservoir releases and water deliveries to the ACWD from the South Bay Aqueduct via Vallecitos Creek, which enters Arroyo de la Laguna just upstream of the Alameda Creek confluence.

1.3 Summary Overview of the Proposed Project

A summary overview of the proposed project is provided below. See Chapter 3, "Project Description," of the EIR for a full description of the proposed project.

1.3.1 Construction

The project construction involves replacement of the existing dam and construction of a new dam immediately downstream of the existing dam. Construction would require excavation of material from nearby areas and transport of the material to construction sites. Construction of the new dam would involve filling a short section of Calaveras Creek immediately downstream of the existing dam, and a resulting loss of aquatic habitat due to the new dam footprint. All land disturbances related to construction would expose soils and increase the potential for erosion, sediment deposition in streams, and impairment of aquatic habitat in Calaveras and Alameda Creeks. During the construction period, Calaveras Reservoir would be maintained at lower than normal storage levels and diversions at the ACDD would be limited.

1.3.2 Operation

Proposed operation of Calaveras Reservoir and the ACDD would influence stream flow and would therefore also influence the aquatic habitat and fish community in Calaveras Creek and Alameda Creek downstream of these facilities. Under the proposed CDRP, future operations of Calaveras Reservoir and Dam and the ACDD would include the following provisions designed to improve habitat conditions for steelhead and other native fishes in the watershed:

- ▶ bypass flows at the ACDD and flow releases from Calaveras Reservoir pursuant to the flow schedule identified in the 1997 MOU (see EIR Project Description Section 3.6.4),

- ▶ flow release schedules proposed to support steelhead when fish passage barriers have been resolved and steelhead are present in upper Alameda Creek (see additional discussion below and EIR Project Description Section 3.6.5),
- ▶ ACDD operational criteria to pass flows down Alameda Creek when diversion of flows is not required to maintain Calaveras Reservoir storage levels (see EIR Project Description Section 3.6.3), and
- ▶ operational procedures for Calaveras Dam releases to avoid cone valve testing during spawning and egg incubation periods and implement flow release ramping criteria (see EIR Project Description Section 3.6.2).

As noted above and further discussed in EIR Section 3.6.5, the SFPUC proposes to implement flow release schedules for steelhead as part of the proposed future operations of the CDRP. These flow release schedules, which would replace the flow releases proposed for resident rainbow trout when the steelhead have regained access above the BART weir as determined by NMFS, specify the *minimum* flow releases that the SFPUC is committing to as part of the proposed CDRP. The proposed flow release schedules are subject to review and approval by NMFS in accordance with the Federal Endangered Species Act (FESA)¹. As such, the proposed steelhead flow release schedules may be adjusted through the federal permitting process during consultation with NMFS.

1.3.2.1 FLOW RELEASE SCHEDULES FOR STEELHEAD

The SFPUC is proposing instream flow schedules for Calaveras Dam and operational rules for flow bypasses at the ACDD to support all native species below these facilities, including anadromous steelhead, resident rainbow trout, and sensitive amphibians.

Hydrologic Classification

In order to develop instream flow schedules that reflect watershed hydrologic conditions, a water-year classification was developed based upon monthly cumulative flows over 26 years of record at the USGS gage on Arroyo Hondo (USGS 11173200), an unregulated tributary upstream of Calaveras Reservoir.

The Arroyo Hondo gage captures 62 percent of the watershed area contributing inflows to Calaveras Reservoir when the watershed area above the ACDD is also taken into account. The Arroyo Hondo gage is therefore used as an indicator of overall watershed hydrologic conditions. Cumulative monthly stream flows at the Arroyo Hondo gage were ranked as exceedance probabilities, then divided into three classes to establish “wet” (0-20 percent), “normal” (21-60 percent), and “dry” (>61 percent) water-year types (a water year begins October 1 and ends September 30). The use of monthly cumulative flows in the water-year type classification allows for changing from one water-year type to another on a monthly basis depending upon cumulative monthly runoff totals, as determined each month from the Arroyo Hondo gage.

Instream Flow Schedules and Flow Bypasses

Flow schedules would be met first through bypasses at the ACDD when flows are naturally present and secondarily through releases from Calaveras Dam.

Schedule ID	Description (water year type)
Schedule C (dry):	Schedule C would provide suitable cold-water spawning and rearing habitat in Calaveras Creek downstream of Calaveras Dam and in Alameda Creek from its confluence with Calaveras Creek downstream through Sunol Regional Park. Schedule C is consistent with the 1997 MOU flow release schedule.

¹ The US Fish and Wildlife Service also would have FESA permitting authority for release schedules with respect to other potentially affected protected species, such as California red-legged frog.

Schedule B (normal): Schedule B would provide suitable cold-water spawning and rearing habitat in Calaveras Creek downstream of Calaveras Dam and in Alameda Creek from the Calaveras Creek confluence downstream through Sunol Regional Park and downstream to the approximate location of the Sunol Valley Water Treatment Plant.

Schedule A (wet): Schedule A would provide additional suitable spawning and rearing habitat in Calaveras Creek downstream of Calaveras Dam and in Alameda Creek downstream of Calaveras Creek while maintaining the extended cold-water rearing habitat provided in Schedule B.

The compliance point for the release schedules would be the Alameda Creek USGS gage (USGS 11173510) downstream of the Calaveras Creek confluence. Detailed flow requirements associated with each schedule are provided below in Table 1.1. Hydrographs for the proposed schedules are provided below in Figure 1.1: Proposed Steelhead Flow Schedules.

Table 1.1
Summary of Proposed Instream Flow Schedules for Steelhead

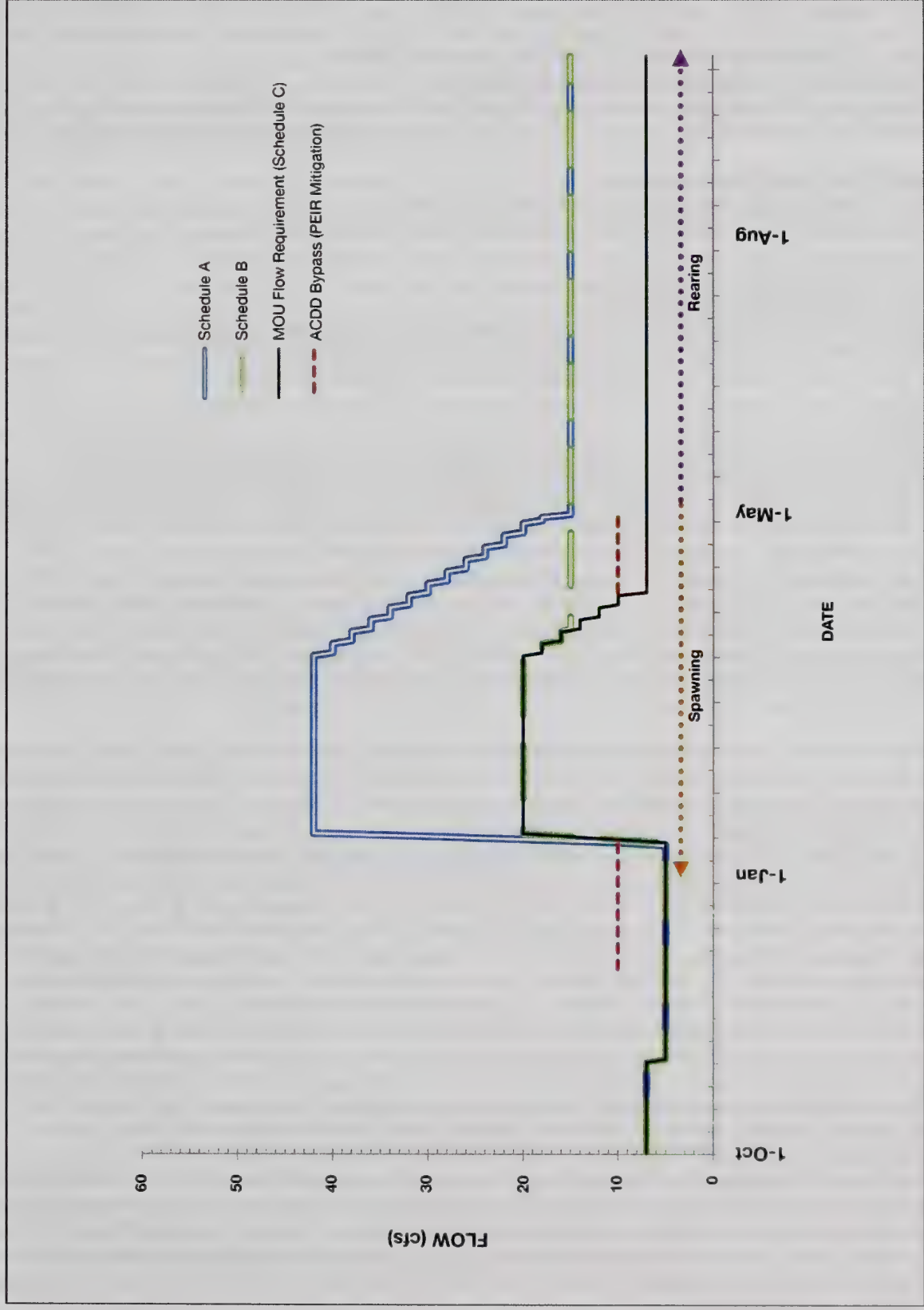
Flow Schedule Decision Date	Flow Schedule Application Date	Dry (Schedule C)		Normal (Schedule B)		Wet (Schedule A)	
		Cumulative Flows for Water-year Classification (MG)	Flow Requirement (cfs)	Cumulative Flows for Water-year Classification (MG)	Flow Requirement (cfs)	Cumulative Flows for Water-year Classification (MG)	Flow Requirement (cfs)
N/A	Oct	N/A	7	N/A	7	N/A	7
N/A	Nov 1 – Nov 30	N/A	5	N/A	5	N/A	5
N/A	Dec 1 – Jan 11	N/A	5 (10)*	N/A	5 (10)*	N/A	5 (10)*
Jan 11	Jan 12 – Jan 31	< 1166	20**	1166 – 3660	20**	>3660	42**
Jan 31	Feb 1 – Feb 28	< 2597	20	2597 – 6882	20	>6882	42
Feb 28	Mar 1 – Mar 31	< 5721	20**	5721 – 11859	20**	>11859	42**
Mar 31	Apr 1 Apr 30	< 6563	7** (10)*	6563 – 17449	15** (10)*	>17449	32-18** (10)*
Apr 30	May 1 – May 31	< 7246	7	7246 – 18211	15	>18211	15
May 31	Jun 1 – June 30	< 7838	7	7838 – 18551	15	>18551	15
Jun 30	July 1 – Sept 30	< 7948	7	7948 – 78693	15	>18693	15

MG = million gallons; cfs = cubic feet per second; N/A = not available.

Notes:

- 1) In addition to releases/bypasses in the table above, the SFPUC shall provide a bypass of up to 10 cfs downstream of the ACDD from December 1 to April 30 when sufficient stream flow is generated by precipitation events. This bypass will be implemented immediately upon completion of project construction.
- 2) In addition to the releases/bypasses in the table above, the SFPUC shall provide a release of a minimum of 2 cfs, as measured at the Calaveras Creek USGS gage (USGS 11173500), from Calaveras Dam. This release will be made regardless of the time of year and other flow schedules. This release will be implemented immediately upon completion of project construction.

* with ramping



Source: SFPUC, unpublished data; compiled by ETJV

Figure 1.1: Proposed Steelhead Flow Schedules

Like unimpaired flows in the watershed, the proposed flow release schedules would provide seasonally variable flows that would also vary depending on water year types. The proposed flow schedules were developed to provide habitat functions necessary to meet the primary constituent elements (PCEs) for CCC steelhead (i.e., freshwater PCEs defined in 70 FR 52488; September 2, 2005).

- ▶ **Freshwater Adult Upstream Migration Corridors and Spawning Habitat:**
 - Sufficient base flow for holding adults and for spawning;
 - Adequate stream flows during and following storms for adult attraction and upstream passage; and
 - Periodic high flow events that maintain channel form, geometry, and other geomorphic functions.
- ▶ **Freshwater Smolt Outmigration Corridors:**
 - Sufficient base flow for downstream movement of juveniles
 - Adequate stream flows during and following storms (for smolt outmigration).
- ▶ **Freshwater Juvenile Rearing Habitat:**
 - Sufficient flow for rearing and foraging;
 - Sufficient flow for maintaining riffles and associated benthic invertebrate productivity;
 - Suitable water temperatures (typically 18°C or less in central California); and
 - Adequate flows for upstream and downstream movement of rearing juveniles.

1.4 Approach

This analysis of future potential individual project and cumulative effects assumes the future presence of migrating steelhead in both the lower and upper Alameda Creek watershed. The assessment includes a description of the existing barriers to migration that would need to be removed or modified in order for steelhead to reach the upper watershed of Alameda Creek, the area in which the potential impacts of the operation of the CDRP would be most readily identified. This analysis includes a cumulative impacts analysis of the CDRP in combination with other past, present, and future SFPUC projects or activities, as well as other non-SFPUC projects or activities under the jurisdiction of various local agencies that have the potential to affect steelhead recovery in the watershed. For purposes of the analysis, the current DSOD-restricted operations (since 2002) stand as the current environmental baseline. However, pre-DSOD restricted conditions (the past 70+ years of operation prior to the DSOD restrictions) and the unimpaired conditions prior to construction of Calaveras Dam and the ACDD provide historical context.

The analysis assumes that existing human-made barriers to anadromous steelhead migration would be removed or other measures would be taken to allow fish migration. No attempt is made here to describe specifically what those barrier removal/bypass projects might entail, as there are no specific adopted designs/plans available (alternatives feasibility studies have been developed for certain projects). Similarly, the analysis does not specifically describe what flow requirements for long-term steelhead population sustainability might be required, which agency(ies) would be responsible for flows and where the flows would be required within the streams, which agency(ies) would undertake the projects, when the projects would be undertaken, or the actual likelihood that they ever would be undertaken. While the analysis is based on a high degree of uncertainty, for purposes of the California Environmental Quality Act (CEQA), this is not considered "remote speculation" because public policy for steelhead restoration has been established for the specific purpose of evaluating the feasibility and actions required to reestablish the historic anadromous steelhead habitat in Alameda Creek, for example as described in the Alameda Creek Fisheries Restoration Workgroup (ACFRW) Memorandum of Understanding (MOU) (2006). Specifically, the MOU describes the purpose of preparing a Study Plan (McBain and Trush 2008) as a "detailed work plan for the work necessary to estimate the range, magnitude, timing, duration, frequency, and location of flows to restore steelhead fisheries (while also considering other native fishes and riparian communities) in the Alameda Creek watershed while minimizing the potential impacts to water supply."

This memo includes a description of the existing habitat conditions related specifically to steelhead life history requirements, existing barriers to migration, and analysis of potential cumulative impacts. The potential impacts of the operation of the proposed project in combination with other reasonably foreseeable projects that would restore steelhead access to upper Alameda Creek in the future are also described. Quantitative analysis of potential impacts of the proposed project operations is based on analysis of recorded stream flow gage data, stream flow

data developed for the SFPUC operations model (Hetch Hetchy/Local Simulation Model [HH/LSM]), and outputs from HH/LSM runs that simulate the proposed project operations. The data developed for the SFPUC HH/LSM represent 82 years of actual and synthesized hydrology, interpolated from nearby watersheds to extend the period of record that is available and incorporate a large range of hydrologic year types. Data developed for the HH/LSM are on a monthly time step and do not provide detail on daily hydrology; however, the data are useful for identifying long-term trends and monthly averages. It is important to note that the modeled stream flows do not include the proposed steelhead flow schedules A and B and are therefore conservative estimates of streams flows associated with future operation of the CDRP. See Section 4.1 below for additional description of the methods and assumptions used in the analysis.

The CDRP would have a less important contribution to future cumulative impacts on steelhead downstream of the confluence with the Arroyo de la Laguna relative to other factors that influence stream flows in this reach of the creek. This is because Alameda County Water District (ACWD) and Zone 7 Water Agency operations in that portion of the watershed drained by the Arroyo Mocho and Arroyo de la Laguna diminish hydrological effects related to the SFPUC operations in the upper Alameda Creek watershed. Factors that obscure the assessment below the Arroyo de la Laguna confluence include seasonal natural and managed flow regimes, diverse water chemistries, and altered water temperature conditions. Additionally, ACWD diversion operations downstream in the lower reach of Alameda Creek further obscure such an assessment.

Each water agency also is looking to its own future management plans for water resources and fisheries, and these have not been integrated on a basin-wide scale at present. Thus, a cumulative impacts analysis with all elements comprehensively integrated remains unavailable at this time. Nevertheless, an analysis of project effects on steelhead in the segment of Alameda Creek downstream of the Arroyo de la Laguna confluence is provided based on a modeled comparison of recent gage flow and estimated changes in flow with the proposed project.

In sum, given the uncertainty about the future conditions and the added complexity of future diverse water management operations in the watershed, the cumulative impacts assessment is both quantitative and qualitative in nature. Many of the questions about what is needed to reestablish an anadromous steelhead run and restore suitable habitat in the basin can be resolved only through the cooperative efforts of multiple water agencies and regulatory authorities in a comprehensive basin-wide assessment and plan. Such a plan is outlined in the ACFRW MOU and is beyond the scope of the CDRP EIR.

2 STEELHEAD LIFE HISTORY STRATEGIES

A detailed account of steelhead life history, including life stage (e.g., migration, spawning, rearing) habitat requirements, is provided in Attachment A. The following discussion focuses on different life history strategies that steelhead may use if they are restored to the Alameda Creek watershed in the future. Information on possible future life history strategies for steelhead was derived from studies/assessments that focused on steelhead recovery in the Alameda Creek watershed, including the following:

- ▶ Alameda Creek Population Recovery Strategies and Instream Flow Assessment for Steelhead Trout (McBain and Trush 2008); and
- ▶ An Assessment of the Potential for Restoring a Viable Steelhead Trout Population in the Alameda Creek Watershed (Gunther et al. 2000).

Steelhead are the anadromous form of *O. mykiss* and have a highly flexible and complex life history. They may follow a variety of life history patterns and strategies. Historic steelhead life history strategies within the Alameda Creek watershed likely occurred in two broad categories (McBain and Trush 2008, pg. 8): (1) fry born in the upper tributaries reared for 1 or 2 years, then migrated rapidly to San Francisco Bay, and (2) following emergence in the upper tributaries, fry moved downstream and reared in the main stem and/or Niles Canyon before entering the estuary and San Francisco Bay. The success of a given strategy likely varied year to year and depended upon several factors (e.g., precipitation and flow, temperatures, food availability). Historically (pre-1900s), headwater tributaries likely contributed large smolts directly to San Francisco Bay, especially during consecutive wet years.

but many additional large smolts were likely produced by slower migrating juveniles that grew on their way downstream through the main stem channels, before smolting and entering the Alameda Creek estuary and then San Francisco Bay.

Assuming fish passage barriers are remedied and steelhead regain access to the upper watershed in the future, a critical period occurs during juvenile freshwater residency. Juvenile fish may remain in the watershed from less than a year to more than 2 years. Those residing in freshwater and/or an estuary less than a full year from the time of egg deposition are considered '0+ juveniles'. Juveniles that spend one complete winter in freshwater and/or an estuary are called '1+ juveniles' and those that remain for two complete winters in freshwater and/or an estuary are considered '2+ juveniles'. Prior to entering the Pacific Ocean, all juveniles physiologically transform into salt-tolerant smolts. Smolts mature into adults and may remain in the Pacific Ocean from 1 to 3 years (or more) before returning to their natal streams to spawn. In California, most adult steelhead returning to spawn have spent at least one full winter rearing as juveniles (i.e., as 1+ juveniles) in their natal watershed (McBain and Trush 2008, pg. 3).

Often each unique period of juvenile freshwater residency (i.e., staying less than a year, more than 1 full year, and slightly more than 2 full years in the watershed) is considered a separate life history strategy. While helpful, these strategies do not sufficiently differentiate patterns of watershed use. For example, a juvenile steelhead spending one winter in Alameda Creek (a '1+ juvenile') might reside high in the headwaters then migrate rapidly to San Francisco Bay, or it might move far downstream shortly following emergence to spend the entire winter in Niles Canyon (if suitable conditions exist) before migrating to San Francisco Bay in late-spring. Both would enter San Francisco Bay as 1+ smolts, but their strategies for utilizing the watershed would have been fundamentally different (McBain and Trush 2008, pg. 3).

A key factor in determining steelhead survival and recovery success is the growth of juveniles during freshwater residency and smolt transition. Fish size at smolting is important to steelhead survival, and big smolts are much more likely to return as spawning adults than small smolts (McBain and Trush 2008, pg. 5). Growth rates during the juvenile rearing period are greatly influenced by both the availability (e.g., access and quantity) and quality (e.g., favorable water temperature and forage availability) of oversummer rearing habitat in the Alameda Creek watershed.

3 EXISTING AND FUTURE BASELINE HABITAT CONDITIONS FOR STEELHEAD

The Alameda Creek basin is an interior Coast Range drainage originating on the northwestern slopes of the Diablo Range and draining towards the San Francisco Bay. The two main branches of the basin, Arroyo de la Laguna and Alameda Creek, form watersheds that join at the western end of Sunol Valley. Alameda Creek can be divided into three distinct reaches: lower Alameda Creek, Niles Canyon, and upper Alameda Creek. A characterization of existing (DSOD-restricted) and projected future (point in future where reasonably foreseeable projects have been implemented) baseline steelhead habitat conditions in the Alameda Creek watershed is provided below. A discussion of past, present, and future projects influencing habitat conditions for steelhead is presented first, followed by a reach-by-reach discussion of steelhead habitat conditions for the extended and primary study areas.

3.1 Existing Conditions

A number of existing facilities under the jurisdiction of ACWD, Alameda County Flood Control and Water Conservation District (ACFCWCD), California Department of Water Resources, SFPUC, and Zone 7 Water Agency, among others, strongly affect hydrological and fisheries habitat conditions in the Alameda Creek watershed adjacent to and downstream of the proposed CDRP. Many of these structures and facilities have been in existence for well over 80 years, and have resulted in changes to the natural conditions that existed in the pre-20th Century history when a steelhead run is presumed to have been present throughout the basin. Although built in the past, these existing facilities and influences continue to operate and affect habitat conditions for steelhead in the Alameda Creek watershed. Some of these are direct barriers to fish migration; others pose various degrees of control/influence over habitat conditions (Gunther et al. 2000). The major facilities (separated by watershed and/or reach) are depicted in EIR Figure 4.5.2: Major Facilities and Fish Passage Barriers/Obstacles in the Alameda Creek Watershed, and include the following:

- ▶ In Arroyo de la Laguna Watershed:
 - Del Valle Dam and Reservoir/South Bay Aqueduct, including State Water Project releases;
 - Quarry lakes recharge facilities;
 - Various channelized and culverted stream segments; and
 - Expanding urban development of the Tri-Valley Area.
- ▶ In Upper Alameda Creek:
 - Calaveras Dam and Reservoir;
 - Alameda Creek Diversion Dam and Tunnel;
 - Sunol aggregate mining operations and quarries;
 - Sunol stream relocation and channelization;
 - Turner Dam and San Antonio Reservoir;
 - Sunol infiltration galleries; and
 - PG&E pipeline crossing protection covering (drop structure).
- ▶ In Niles Canyon:
 - USGS gaging station weir.
- ▶ In Lower Alameda Creek:
 - ACWD's upper, middle, and lower inflatable dams and quarry pits recharge facilities;
 - BART weir; and
 - ACFCWCD channelization project.

All of these facilities combined with urbanization and other land use activities have resulted in alteration of habitat conditions for steelhead in the watershed. It is worth noting that two historic structures – the Niles and Sunol dams, both located on Alameda Creek below the Sunol quarries – were removed in 2006 by the SFPUC. The East Bay Regional Parks District (EBRPD) also removed two small barriers from Sunol Wilderness Regional Preserve in recent years.

3.2 Future Projects Influencing Habitat Conditions for Steelhead

Reasonably foreseeable future projects potentially affecting conditions for steelhead in the Alameda Creek watershed are listed below. Possible projects in the Arroyo de la Laguna watershed by Zone 7 and others are not considered here for several reasons. First, the CDRP would not affect that portion of the basin. Second, these potential projects would not be anticipated to influence habitat conditions downstream in the extended study area. Most of the habitat enhancement and barrier removal projects in the Alameda Creek watershed do not include specific planning details at present, but for the purposes of this analysis they are assumed to be habitat or watershed enhancement projects intended to reverse some of the degradation of watershed resources that has resulted from a century of human alteration. The list includes several projects that are in various stages of planning and implementation by public agencies, citizens' groups, and quarry operators. These projects range from removing or modifying dams, weirs, culverts, and pipelines that block fish passage and installation of positive barrier fish screen at water diversions to restoring and protecting habitat and providing instream flows. Non-SFPUC projects include ACWD's Alameda Creek steelhead passage activities and aggregate quarry operations and associated restoration/reclamation activities not under SFPUC lease (e.g., areas mined by Hanson Aggregates – Surface Mining Permit [SMP] 5 on the left bank of Alameda Creek [looking downstream]).

Of particular importance to this analysis is the existence of several fish migration barriers in the watershed and associated future projects to address passage. These obstructions include the ACFCWCD's grade control structure (also known as the BART weir) located about 9.5 miles upstream from the creek's confluence with San Francisco Bay; ACWD rubber dams (ranging in location from about 2 miles upstream of the Bay to just below Niles Canyon); the U.S. Geological Survey (USGS) gaging station weir/concrete apron in Niles Canyon; and the Pacific Gas & Electric (PG&E) concrete drop structure in the Sunol Valley (see EIR Figure 4.5.2). ACWD is removing its lower-most rubber dam during the summer 2009 (anticipated to be completed by October 2009). The SFPUC removed above-ground portions of two relict diversion dams located on the creek (Sunol Dam and Niles Dam) in September 2006. Other migration barriers along the creek are in various stages of planning to address passage.

Future projects included in this analysis and their planning status are described below:

- ▶ ACWD and ACFCWCD Alameda Creek Steelhead Passage Activities – The following projects are being implemented with the ACFRW:
 - ACWD's lower, middle, and upper rubber dams (located approximately 16.6, 16.4 and 15.4 miles downstream of Calaveras Dam, respectively). The rubber dams, in conjunction with a series of gated pipelines, are used to divert water from Alameda Creek into adjacent ponds, which provide groundwater recharge into the Niles Cone Groundwater Basin. This water is an important source of water supply for the cities of Fremont, Newark and Union City. These rubber dams typically remain inflated during the summer and fall months. During the winter through spring, the dams are typically raised and lowered in response to rainfall, the amount of resultant flows anticipated in Alameda Creek, and water levels in the adjacent recharge ponds. The rubber dams, when inflated, have been identified as impediments to fish passage.
 - Accordingly, ACWD has decided to decommission the lower rubber dam to improve fish passage. Environmental review for decommissioning the lower rubber dam was completed in 2006. The construction contract for the work was awarded in April 2009 and the work is anticipated to be completed by October 2009. The project includes removing the existing rubber dam and installing a low-flow fish passage facility.
 - Design of fish passage facilities over the middle and upper rubber dams is in progress. As part of an agreement made in 2007 between ACWD and ACFCWCD, the ladder over the middle dam will also extend over the adjacent BART weir (further information provided below), and the project is being undertaken jointly by the two agencies. Under this agreement, the goal of both agencies is to have the fish passage facility constructed by the end of calendar year 2010. Design of the upper rubber dam fish ladder is anticipated to be completed in 2011. Development of CEQA documents for both fish passage projects is also underway, with completion of the environmental review process anticipated for fall 2009. CEQA will be in the form of a Mitigated Negative Declaration with ACWD and ACFCWCD serving as joint lead agencies. An internal draft Mitigated Negative Declaration has been completed and is being reviewed by ACWD and ACFCWCD. Development of a biological assessment for the fish passage projects is also underway, with a draft biological assessment scheduled to be completed by fall 2009.
 - The BART weir (located approximately 16.5 miles downstream of Calaveras Dam and immediately adjacent to ACWD's middle rubber dam). The facility was constructed in 1972 to protect the foundation elements of the Union Pacific Railroad and BART bridges crossing Alameda Creek. The facility consists of a 12-foot-high, bank-to-bank, sloping concrete grade control structure. Steelhead have been seen at the base of the structure unsuccessfully attempting to swim upstream. It is an acknowledged barrier to fish passage, under all flow conditions. Design of fish passage facilities over the BART weir is being performed jointly by ACWD and ACFCWCD, as described above.
- ▶ PG&E pipeline concrete apron drop structure (approximately 7 miles downstream of Calaveras Dam) – Constructed in 1997 by PG&E, this structure protects a large natural gas pipeline under the creek. The segment of Alameda Creek in the vicinity of the drop structure was moved to its current location and placed in a trapezoidal engineered channel in the 1970s. The SFPUC plans to coordinate planning for a passage project at this location with PG&E through the selected long-term operator of its Sunol Valley Quarry (SMP 30 – currently in negotiation with the selected operator). CEQA/NEPA environmental review has yet to begin.
- ▶ SFPUC's Sunol Valley Sand and Aggregate Quarry Operations SMP 30 (approximately 6.2 miles downstream of Calaveras Dam) – This includes projects to be undertaken by the quarry operator to correct losses of water into quarry pits, enhance riparian vegetation, and develop and implement a Sunol Valley Restoration Plan. There is limited fish passage and degraded habitat value in this reach due to past mining-related realignment of the creek channel (noted above), which results in mining pit capture of a significant amount of Alameda Creek flows at the head of the realigned creek. The SFPUC proposes to coordinate planning for an Alameda Creek channel restoration project at this location as part of its negotiation with the selected operator of its

Sunol Valley Quarry. The SFPUC will require the operator to construct a slurry cutoff wall to reduce inflow to the pit as well as provide restoration of riparian habitat on the right bank of Alameda Creek and the left bank of San Antonio Creek (looking downstream), and provide funding for the Sunol Valley Restoration Plan. A specific plan for these actions has not yet been developed. CEQA/NEPA environmental review has yet to begin, which may include planning information for fish passage at the PG&E pipeline drop structure.

- ▶ SFPUC's proposed Upper Alameda Creek Filter Gallery Project (ACFGP; previously named the Alameda Creek Fishery Enhancement Project) would allow for the recapture of up to 6,300 AF of water released from the Calaveras Reservoir or bypassed at ACDD to enhance the local fishery and improve downstream riparian habitat in the portion of the creek between Calaveras Creek and the Sunol Valley Water Treatment Plant. The released water would be recaptured at a suitable point downstream for return to the regional water system. This project is consistent with the terms of a 1997 MOU between SFPUC and California Department of Fish and Game (CDFG 1997). This proposed project is still in the alternatives analysis phase, so a definitive scope has not yet been developed. Recapture facilities may include new alluvial wells, rehabilitation of the existing Sunol infiltration galleries, and installation of a well field near the Sunol quarries. Treatment of the recaptured water may be required in addition to that which would be provided by the SVWTP. Conveyance of the water from the recapture points to the existing Sunol Valley water storage sites may include rehabilitation of the existing Sunol Pump Station and installation of new pipelines. The proposed flow schedules identified under CDRP are to be implemented under CDRP regardless of the status of the ACFGP flow recapture facility.

3.3 Reach-by-Reach Characterization of Habitat Conditions for Steelhead

The lower Alameda Creek and Niles Canyon reaches are in the CDRP extended study area while the upper Alameda Creek reach is within the CDRP primary study area. In the following discussion, the segments of Alameda Creek (and tributaries) within the primary study area (see EIR Figure 4.5.1) are discussed at a greater level of detail, with a description of the specific characteristics of each study sub-reach.

3.3.1 Extended Study Area

3.3.1.1 LOWER ALAMEDA CREEK

Existing Conditions

Beginning downstream from the mouth of Niles Canyon, Alameda Creek flows approximately 10 miles across a broad low-gradient alluvial plain to San Francisco Bay. Historically, before extensive urbanization of the floodplain, the stream channel was relatively unconfined and would migrate and form different courses and distributary channels (Gunther et al. 2000, pg. 22; Leidy 2007, appendices). These channels were tidally influenced in their lower sections and likely provided valuable estuarine habitat function for rearing juveniles or for smolts during their transition to the higher salinity of bay water (Gunther et al. 2000, pg. 22).

The lower Alameda Creek channel was extensively modified beginning in the 1950s as a result of floods that inundated the surrounding urbanizing area and instream aggregate extraction, and the channel served increasingly as a flood control and water conveyance facility. Following disastrous floods in Fremont in the 1950s, the lower reaches of Alameda Creek (i.e., downstream of Niles Canyon) were rerouted in the 1960s into a trapezoidal flood control channel confined between artificial levees. To maintain flood control capacity, sediment and vegetation must be periodically removed from the channel. The historic floodplain has been largely converted to residential, commercial, and industrial urban uses. Commercial salt production was carried out in an extensive system of evaporation ponds that removed historic wetlands and natural tidal channels – the ponds currently are being planned for restoration to those former conditions (South Bay Salt Ponds Restoration Project). Restoration activities have been ongoing at Coyote Hills Regional Park on the southern side of the channel for many years and flood gates connect wetlands in the park to the channel in its lower reach. Water supply and flood control structures were incorporated into the channel including a bank to bank grade control structure at the BART and Southern Pacific Railway rail crossings (i.e., the BART weir) and a series of inflatable dams for water supply impoundment (including flows imported from the Sacramento – San Joaquin Delta via the South Bay Aqueduct), local aquifer recharge, and diversion. These features prevent fish migration and impair other habitat functions. The BART weir presents a complete barrier to all migrating anadromous fish species with the possible exception of Pacific lamprey (*Lampetra tridentata*) (Gunther et al. 2000, p. 15). The lower, middle, and upper ACWD inflatable dams are also major migration obstacles/barriers in the lower Alameda Creek.

Aquatic habitat conditions in the lower Alameda Creek are characterized by low summer flows, high summer water temperature, substrate with a large silt component, extensive stands of emergent vegetation, and tidal mixing with increased salinity in the lower sections near the Bay and freshwater flows in the higher lying reaches above the BART weir. Some sections may be dry during the summer (Hanson Environmental Inc. 2002).

Projected Future Baseline Conditions

Assuming fish passage barriers are remedied in the future, the majority of the lower Alameda Creek reach would not be expected to provide necessary spawning or rearing habitat functions for steelhead; the tidally influenced habitats toward the mouth of the creek may provide only limited transition habitat for steelhead smolts that are emigrating to the Bay (Gunther et al. 2000, pg. 25; McBain and Trush 2008, pg. 8). Several key uncertainties regarding habitat restoration needs (e.g., flow, passage, water temperature) for steelhead recovery in the lower Alameda Creek reach have been identified (McBain and Trush 2008) and are discussed in Section 4 below.

3.3.1.2 NILES CANYON

Existing Conditions

Beginning downstream of the Arroyo de la Laguna confluence, Alameda Creek flows approximately 6.5 miles through Niles Canyon to Niles Junction (near the crossing of Highway 238). The stream channel is relatively confined within the steep walled canyon and, with the exception of Highway 84 and a rail line, there is little development on the narrow floodplain and surrounding hills. There is a relatively well developed riparian zone throughout Niles Canyon. There are two major tributaries in this reach, Sinbad Creek and Stonybrook Creek. The reach is a relatively low-gradient (approximately 1-2 percent) perennial stream characterized by large, moderately deep pools, and runs separated by short, shallow riffles. The substrate is highly variable, ranging from sand, gravel, and cobble dominated riffles and glides to cobble-boulder and silt, mud, and sand pools.

Historically, Alameda Creek in Niles Canyon was likely an intermittent to perennial stream characterized by low flows during late summer and fall. Low dry season flows were derived primarily from upstream subsurface flows (shallow groundwater that enters the canyon below Sunol) that may have been relatively cool due to its source as groundwater and the limited exposure to warm atmospheric conditions in the shady canyon. Additionally, cool groundwater may have existed historically in the lower segments of Arroyo de la Laguna due to artesian flow from the Livermore Valley. During this low flow condition, some pools may have thermally stratified and provided critical thermal refuge (cool water layer on the bottom of pools) during summer months, but overall this reach likely would not have provided desirable habitat for 1+ year-old or 2+ year-old juvenile steelhead to reside over the last half of summer and early fall (McBain and Trush 2008, pg. 10).

Alameda Creek through Niles Canyon now serves as a conveyance for imported water supply from the South Bay Aqueduct turnout in Vallecitos Creek, which is tributary to Arroyo de la Laguna just upstream of the Alameda Creek confluence. As a result, summer base flows in Niles Canyon have increased and become less variable, thereby increasing overall water (and pool) temperatures, reducing thermal buffering that historically occurred with subsurface flows, reducing potential pool stratification, and subsequently reducing potential rearing habitat for steelhead. However, although the stream temperatures within the reach are probably higher than pre-development historical flows, augmented flows potentially provide atypical fast water habitat with increased forage production that may allow steelhead to obtain sufficient food to withstand warmer temperatures and associated increased metabolic rates (Gunther et al. 2000, p. 18).

Flow in lower Alameda Creek is measured by two USGS gages near the downstream end of Niles Canyon and within the flood control channel, near the Interstate 880 overcrossing. These gages record flows from the Sunol Valley (Alameda Creek) and the Livermore Valley (Arroyo de la Laguna, Arroyo Mocho and Arroyo Del Valle) as well as releases made into the creek from the State Water Project on Vallecitos Creek and inflow from the Niles Canyon watershed. Recent flow data from the Niles gage is presented below to illustrate the range and seasonal variation of flows in lower Alameda Creek. The Niles gage has been in operation since 1891; however, the data presented in Section 4.6 of the EIR (see EIR Table 4.6.8 and in Figure 4.6.8: Daily Flow in Alameda Creek near the Downstream End of Niles Canyon, Water Years 1995-2009) illustrate flows under more recent operation of water control facilities in the upper watersheds (including Alameda and Arroyo de la Laguna). Similar to the creeks in the upper watersheds, flow at Niles is “flashy”; that is, the creek has brief periods of high flows

interspersed with longer periods of low flows, with daily peaks of high flows in winter months and very low flow in summer months.

Because of the augmented summer flows, rearing conditions in wet hydrologic years could be improved (over natural conditions) despite higher water temperatures, assuming steelhead tolerate these higher temperatures. In some instances, with sufficient food present steelhead may tolerate warmer water temperatures (Smith 1999). Local anglers continue to catch rainbow trout in the Niles Canyon reach, despite the cessation of trout stocking several years ago (Alexander, pers. comm., 2007), suggesting possible successful rearing. However, while rainbow trout from farther upstream could move in the Niles Canyon reach during wet years, it is likely that the conditions are generally not conducive to oversummering in this reach. Results of water temperature monitoring within the Niles Canyon reach of Alameda Creek during 2001-2002 (Hanson Environmental 2002) showed summer temperatures in excess of 75 degrees Fahrenheit (°F), which would affect the ability of juvenile and adult steelhead to oversummer within the canyon reach. Monitoring conducted by Hanson Environmental in 2001 and 2002 also shows that water in Alameda Creek is in thermal equilibrium by the time it flows into Niles Canyon, likely due to the prolonged solar warming occurring in Alameda Creek from the Sunol Regional Wilderness to the Niles Canyon reach and through the discharge of warm storm water from the Livermore Valley (after warming in the open flood control channels in that area). Furthermore, operation of upstream storage facilities including Del Valle, San Antonio, and Calaveras Reservoirs has reduced winter and spring peak flows from historic conditions in this reach of Alameda Creek.

Projected Future Baseline Conditions

The USGS Niles gaging station weir/concrete apron, which acts as a fish barrier under moderate to low flows, is assumed to be removed or retrofitted to allow fish passage under a more full range of flows as a future action. While not located in the Niles Canyon, improvements in the nearby upstream Sunol quarries (noted previously) may result in increased surface flow into the Niles Canyon reach. Over the long term this may result in increased storage of water in the shallow creek alluvium in the lower Sunol Valley and shallow groundwater surfacing into Niles Canyon, thereby potentially resulting in increased stream flow, cool-water thermal buffering (through decreased exposure to atmospheric conditions), and an extended period of flow through the canyon. Collectively, these future projects would be expected to slightly improve rearing habitat conditions for steelhead in the upper portion of the Niles Canyon reach. Due to the limited amount of shallow water storage in the alluvium, this improvement may only be realized in the upper portion of the Niles Canyon reach.

3.3.2 Primary Study Area

3.3.2.1 UPPER ALAMEDA CREEK

Steelhead would potentially have access to Alameda Creek and a short segment of Calaveras Creek in the primary study area in the future if the passage barriers described above are remedied. Under the existing and projected future conditions, fish passage would continue to be limited by obstacles/barriers at Turner Dam (on San Antonio Creek), low-gradient, shallow riffles in Reach A-1, Little Yosemite, ACDD, and Calaveras Dam. There are several key factors that determine suitability of aquatic habitat for steelhead that can be potentially limiting factors to recovery. These include the frequency and quality of summer pool habitat, substrate conditions, bank and riparian canopy conditions, stream temperature, cover, food base, and barriers to fish movement. These factors interact with each other to various degrees and are heavily influenced by stream flow and the operation of Turner Dam, ACDD, and Calaveras Dam.

The following summarizes key information relative to existing and future conditions affecting steelhead in upper Alameda Creek.

Reach A-1 (Upper Alameda Creek)

Existing Conditions

From the outlet of the Sunol Valley (confluence with Arroyo de la Laguna) upstream for about 3.5 miles, Alameda Creek flows through a wide, low-gradient (approximately 0.5-1 percent) alluvial valley with intermittent flows. This reach has also been documented to be a “losing reach” where flow measurements have shown a progressive decrease in stream flow with distance downstream including losses up to 36 percent at certain locations (ENTRIX 2006, pg. 15-20). The lower part of the Sunol Valley has been heavily influenced by sand and aggregate mining

activities, including relocation of the channel in some locations, pumping to dewater quarry areas, and a system of infiltration galleries used for golf course irrigation water supply (through a lease with the SFPUC). Fish migration is limited in this segment due to the presence of several low-gradient, shallow riffles and the PG&E pipeline crossing. The reach upstream of the quarries consists of sycamore alluvial woodland habitat, and examination of historical aerial photos indicates that similar habitat existed in the lower segment prior to mining activities. Fish monitoring conducted by SFPUC (summarized in ETJV 2008) immediately above this reach (A-2) indicates that habitat conditions favor warm-water species (in 10 years of monitoring, rainbow trout have never been collected or observed in this reach).

Diversions from Alameda Creek to Calaveras Reservoir have been reduced because of the DSOD restrictions on Calaveras Reservoir. Currently, Calaveras Reservoir is often filled near, or above, the maximum DSOD permitted storage level with runoff from its natural drainage. At these times, the reservoir has no capacity to accept diversions from Alameda Creek. Therefore, while the DSOD restrictions on Calaveras Dam are in effect, the SFPUC is unable to capture most local watershed runoff from upper Alameda Creek, and post-2002 flows in Alameda Creek below the diversion dam have been greater than they were prior to 2002.

Total flow in Reach A-1 of Alameda Creek (and upstream to the confluence of Calaveras Creek) is the product of the combination of releases from Calaveras Dam, flow spilled over the ACDD, releases from Turner Dam into San Antonio Creek (tributary to Alameda Creek), and the unregulated inflow runoff occurring between Reach A-1 and the diversion dam and Calaveras Dam. However, because most of the flows from Arroyo Hondo and Calaveras Creek were historically retained in Calaveras Reservoir for water supply storage, the vast majority of Alameda Creek flows in Reach A-1 have originated above the diversion dam (except when diversions are occurring at the ACDD and/or releases are being made from Calaveras Dam). Based on hydrologic modeling, operational releases from Calaveras Reservoir occur in about 40 percent of the years under the existing condition, with most of these years being classified as above-normal or wet.

Two USGS gages are located within the Sunol Reach of Alameda Creek. Operations of the ACDD and Calaveras Reservoir are reflected in data from these gages. The gages are located on Alameda Creek below the confluence with Calaveras Creek and below the confluence with Welch Creek. However, data from these gages are of limited utility.

The gage downstream of Calaveras Creek is a low flow gage and only records data for flows less than 200 cfs. The period of record for this gage is from water year 1997 to present. The gage below Welch Creek has been operational since October 1999 and largely reflects operation of Calaveras Reservoir under the DSOD restriction requirements for maintaining reduced storage in Calaveras Reservoir. The data for both gages are also influenced by tributary inflow and runoff between the gages.

Table 4.6.7 provides a summary of monthly data from the Welch Creek gage and Figure 4.6.7: Daily Flow in Alameda Creek Below the Welch Creek Confluence, Water Years 2000-2009, in the EIR shows daily flow at the gage as well as historic daily reservoir levels. Periods of high flow at the gage correspond with both filling and releasing at the dam. Other periods of steeply dropping water surface elevation without flow spikes in Alameda Creek indicate diversions for water supply and, to a much lesser degree, evaporation from Calaveras Reservoir.

Projected Future Baseline Conditions

Future projects identified for this segment of Alameda Creek include providing for fish passage at the PG&E pipeline crossing, constructing a cutoff wall along the eastern bank to reduce mining pit capture of surface and groundwater accretions from Alameda Creek, and restoring the channel and associated right bank (downstream) within the historically realigned section of Alameda Creek adjacent to the Sunol mine (i.e., SMP 30), all of which would improve migration conditions for steelhead. Additionally, the SFPUC's ACFGP may also be located in this reach; the specific location of this facility has not yet been determined by the SFPUC. Spawning habitat functions and rearing habitat for steelhead in this reach would continue to be limited due to intermittent stream flow and seasonal warm-water temperatures.

Reach A-2 (Alameda Creek)

Existing Conditions

About 0.5 mile downstream of the bridge near the entrance of the SVWTP to the confluence of Calaveras Creek, the valley narrows and the stream becomes more confined, primarily within a single channel bordered by relatively well-developed riparian trees and undergrowth. The relatively confined channel is characterized by long pool and run sequences broken by short riffles. Much of the pool habitat is relatively deep (2.5-foot depth or greater). Stream flow during the summer may become intermittent in dry years but less variable than that in Reach A-1. Summer conditions are generally not suitable for cold-water fish species (including steelhead). SFPUC studies have shown that this reach favors native warm-water fish species, and many portions of this reach are influenced by cattle-grazing activities along the creek banks and in the channel. In some areas, the stream widens and instream flows become shallow with very little riparian cover, which warms the water over short linear lengths especially during the summer. Algal growth in the creek can be extensive during the summer and early fall (survey data and monitoring results summarized in ETJV 2008). The upper portion of this reach of Alameda Creek was the area designed to benefit from flows under the 1997 MOU (CDFG 1997, p. 4). Similar to Reach A-1, total flow in Reach A-2 of Alameda Creek is the product of the combination of releases from Calaveras Dam, flow spilled past the ACDD, and the unregulated runoff occurring between this reach and the diversion dam and Calaveras Dam.

Temperature measurements taken in Reach A-2 between July 16 and October 26, 1998 ranged from a high of 29.3°C during early September to a low of about 10.5°C in October, with daily temperature fluctuations ranging from 6°C to 10°C (ETJV 2008). In 2004, the average dissolved oxygen (DO) concentration for the three monitoring stations in the same stretch of Alameda Creek below the confluence with Calaveras Creek was 5.5 milligrams per liter (mg/L), the average pH was 7.3, the average temperature was 14.7°C, and the average turbidity was 0.89 nephelometric turbidity units (NTU) (SFPUC 2006, p. 5-19).

Projected Future Baseline Conditions

No projects are planned in this reach, conditions for spawning, rearing and migration would continue as under the existing condition.

Reach A-3 (Alameda Creek)

Existing Conditions

Just upstream of the Calaveras Creek confluence, in the area commonly referred to as Little Yosemite, the Alameda Creek channel becomes very steep (approximately 15 percent gradient), and is well confined with little or no floodplain. Habitat in this reach is generally considered good quality for both warm- and cold-water fish species; however, access for steelhead would continue to be impeded by the steep gradient and migration barriers including falls. Winter and spring (and potentially year-round) stream flow in this reach is influenced by operations of the ACDD (see EIR Table 4.6.14 for recent periods of ACDD operation). As described above, diversions from Alameda Creek to Calaveras Reservoir at the ACDD have been reduced because of the DSOD restrictions on Calaveras Reservoir.

Temperature measurements in Reach A-3 between July 16 and October 26, 1998 ranged from a high of 24.3°C in mid-July and early August to a low of 12°C in October, with daily temperature fluctuations ranging from 2°C to 6°C (SFPUC 1999, p. 4-1). In 2004, the average DO concentration for the three monitoring stations in Alameda Creek below the ACDD was 7.9 mg/L, the average pH was 7.7, the average temperature was 15.7°C, and the average turbidity was 0.83 NTU (SFPUC 2006, p. 5-19).

Projected Future Baseline Conditions

No projects are planned in this reach, conditions for spawning, rearing and migration would continue as under the existing condition.

Reach A-4 (Alameda Creek)

Existing Conditions

Upstream of Little Yosemite to the ACDD, the stream gradient generally decreases (approximately 2-4 percent); however, there are a few relatively steep sections (>10 percent). Habitat is somewhat fragmented by sections of stream with alternating alluvial sections that go dry in summer and by steep bedrock canyon gradient sections that present upstream migration passage obstacles, and possibly barriers, for fish. Access to this reach by steelhead would be limited by barriers at Little Yosemite. Operation of the ACDD (i.e., diversion of water to Calaveras Reservoir) can greatly influence aquatic habitat conditions downstream, as all flows up to 650 cfs can be diverted when the gates to the diversion tunnel are open in the winter and spring. ACDD diversions can result in low or no flow conditions downstream at times when flow would otherwise be present (see EIR Table 4.6.14 and Figure 4.5.3).

Due to the DSOD operating restriction, the SFPUC has diverted flows from Alameda Creek to Calaveras Reservoir less frequently than the historic operations. Therefore, more water from the upper watershed has been allowed to bypass the ACDD and into this reach. As shown in EIR Table 4.6.13, unimpaired flows upstream of the ACDD in Alameda Creek are seasonally highly variable with minimal flows during the summer months.

Projected Future Baseline Conditions

No projects are planned in this reach. Conditions for migration, spawning, and rearing would continue as under the existing condition.

Reach C-1 (Calaveras Creek – downstream of Calaveras Reservoir)

Existing Condition

Reach C-1 is a very short reach (approximately 0.6 mile) extending from the confluence with Alameda Creek upstream to Calaveras Dam. The reach consists of deep pools, glides, and short low-gradient riffles formed by steep rocky gorge-type topography with bedrock and large boulders. Stream hydrology is highly altered by the operations of Calaveras Dam and stream water temperature is directly influenced by reservoir water temperatures. Habitat values would be considered marginal for steelhead due to the steep rocky gorge-type topography with isolated pools within bedrock and large boulders, and altered stream hydrology. Additionally, fish monitoring conducted by SFPUC (summarized in ETJV 2008) indicates that rainbow trout do not occupy this reach; rather, the community is dominated by native warm-water species. Rainbow trout are present only in the stilling basin and have no route of access to the creek. This reach was not directly considered as part of the 1997 MOU, as the point of compliance is downstream below the confluence with Alameda Creek on the main stem and minimum flows can also be met by flows bypassed at ACDD.

Flow in this reach of the creek is controlled by releases from Calaveras Reservoir and dam seepage, which has been estimated at 0.5 to 1 cfs when the reservoir is full (CDFG 1997). Flow recorded at the USGS gage on this section of creek is regularly less than 0.2 cfs when releases from Calaveras Dam are not being made.

Apart from releases and spills based on hydrology, the cone valve below Calaveras Dam is periodically operated for maintenance purposes. This operation usually occurs at least once per year and provides 1 to 2 days of flows of approximately 870 cfs (depending on reservoir water surface elevation).

The USGS gage was recently installed in Calaveras Creek below Calaveras Reservoir, with data available from October 2002 to the present. Flow rates in this reach of the creek are assumed to have generally increased in volume and duration in comparison with similar past hydrologic years under the pre-DSOD restricted operating condition, due to increased releases required at present to maintain the lowered reservoir water level. However, data quantifying the degree of this increase are partially available due to the brief gage record. Gage flow records for this reach exist only for water year 2003 to the present (as well as for a few years prior to original dam construction).

Table 4.6.4 in the EIR presents the monthly statistics for water years 2003-2009, which clearly shows periods of release from Calaveras Dam followed by long periods of very little base flow. In this reach of Calaveras Creek downstream of Calaveras Dam, water quality monitoring has been performed as part of aquatic resource

surveying since 1998. This area of Calaveras Creek had a turbidity measurement of 0 NTU, DO concentration of 7.9 mg/L, and a pH of 7.85 (SFPUC 1999, Table 4.3). In 2004, the average DO concentrations for the monitoring stations on Calaveras Creek (Monitoring Stations 8-1 and 8-2) was 3.9 mg/L, the average pH was 7.07, and the average turbidity was 0.92 NTU (SFPUC 2006, p. 5-19).

Projected Future Baseline Conditions

No projects are planned in this reach, conditions for migration, spawning, and rearing would continue as under the existing condition.

4 FUTURE CUMULATIVE EFFECTS ANALYSIS

4.1 Methods and Assumptions

Cumulative impacts on steelhead that could result from project operations are quantitatively and qualitatively evaluated herein based on proposed project-related changes in releases from Calaveras Dam, diversions from ACDD, and management of Calaveras Reservoir levels (and resulting water quality effects from restoring the full reservoir pool elevation and removal of the DSOD storage restriction). Impacts that could result from project operations were quantitatively and qualitatively evaluated based on proposed project-related changes in releases from Calaveras Dam, diversions from the ACDD, and management of Calaveras Reservoir levels. Quantitative analysis of potential impacts of the proposed project operations is based on analysis of recorded stream flow gage data, stream flow data developed for the SFPUC operations model (HH/LSM), and outputs from HH/LSM runs that simulate the proposed project operations. The data developed for the SFPUC HH/LSM represent 82 years of actual and synthesized hydrology, interpolated from nearby watersheds to extend the period of record that is available and incorporate a large range of hydrologic year types. Data developed for the HH/LSM are on a monthly time step and do not provide detail on daily hydrology; however, the data are useful for identifying long-term trends and monthly averages. It is important to note that the HH/LSM does not include steelhead flow schedules A and B and therefore is conservative in simulating streams flows associated with future operation of the CDRP when steelhead regain access to Alameda Creek upstream of the BART weir. See Section 4.6.2.2 of the EIR for additional description of the HH/LSM assumptions and runs completed.

This cumulative impact assessment assumes that all downstream human-made barriers to fish passage below Calaveras Dam and the ACDD are removed and anadromous steelhead have access to the upper Alameda Creek watershed. This analysis does not address steelhead access into the Arroyo de la Laguna portion of the upper watershed because those reaches would not be influenced by the proposed CDRP. The assumption that steelhead would have access to the upper watershed entails uncertainty regarding when the existing passage barriers would be remedied, what forms of stream and riparian restoration might be undertaken in Alameda Creek, and what numbers of anadromous steelhead may find their way into the upper watershed. Additional uncertainty exists regarding the current altered flow regimes in the watershed and because the process to determine flows necessary for steelhead would be completed after construction of the proposed CDRP.

4.2 Project Effects

The following analysis evaluates the potential cumulative impacts of operation of the CDRP on steelhead in combination with other past, present, and reasonably foreseeable future projects. The analysis considers future conditions under the assumption that the fish passage barrier removal and other habitat improvement projects identified above have been implemented, and steelhead access has been successfully restored in the upper Alameda Creek watershed.

As discussed above, under the proposed CDRP, future operations of Calaveras Reservoir and the ACDD would include the following provisions designed to improve habitat conditions for native fishes in the watershed:

- ▶ Bypass flows at the ACDD and flow releases from Calaveras Reservoir pursuant to the flow schedule identified in the 1997 MOU (see EIR Project Description Section 3.6.4),
- ▶ Flow release schedules proposed to support steelhead spawning, egg incubation, and rearing when fish passage barriers have been resolved and steelhead are present in upper Alameda Creek (see EIR Project Description Section 3.6.5),

- ▶ ACDD operational criteria to pass flows down Alameda Creek when diversion of flows is not required to maintain Calaveras Reservoir storage levels (see EIR Project Description Section 3.6.3), and
- ▶ Operational procedures for Calaveras Dam releases to avoid cone valve testing during spawning and egg incubation periods (see EIR Project Description Section 3.6.2).

As noted above and further discussed in Section 3.6.5 of the EIR, the SFPUC proposes to implement flow release schedules for steelhead as part of the proposed future operations of the CDRP. These flow release schedules, which would replace the flow releases proposed for resident rainbow trout when the steelhead have regained access above the BART weir as determined by NMFS, specify the *minimum* flow releases that the SFPUC is committing to as part of the proposed CDRP.

A summary of Alameda Creek steelhead habitat conditions under existing, future cumulative without CDRP, and future cumulative with CDRP is provided in Table 4.1 followed by an in-depth discussion of effects by study reach.

4.2.1 Primary Study Area

The evaluation of operations-related effects within the primary study area is divided into three separate discussions based on stream reaches:

- ▶ Alameda Creek from the ACDD to the Calaveras Creek confluence;
- ▶ Alameda Creek from the Calaveras Creek confluence to Arroyo de la Laguna; and
- ▶ Calaveras Creek below Calaveras Dam.

4.2.2.1 ALAMEDA CREEK FROM THE ACDD TO THE CALAVERAS CREEK CONFLUENCE

Under existing and future baseline conditions, streamflow in Alameda Creek downstream of the ACDD is not reflective of a natural hydrograph but instead is highly dependent on operation of the ACDD. Unregulated watershed runoff and seepage beneath and around the ACDD contribute to flows in this reach of the creek but in a much smaller proportion compared to water flowing over the ACDD when the diversion gate is closed or when flow in Alameda Creek upstream of the ACDD exceeds the 650 cfs capacity of the diversion tunnel. The proposed project would not alter the ACDD so as to affect seepage or unregulated runoff. Consequently, the following analysis focuses on whether proposed changes in operation of the ACDD would substantially alter streamflows in the reach of Alameda Creek between the ACDD and the Calaveras Creek confluence such that they would be outside the range of pre-project conditions and result in substantial hydrologic changes.

As described in Section 4.6 of the EIR (see Table 4.6.18 and Figures 4.6.13a, 4.6.13b, 4.6.14a, and 4.6.14b), the proposed project would not substantially alter streamflows in Alameda Creek downstream of the ACDD such that they would be outside the range of pre-project conditions and result in substantial hydrologic changes. Under the proposed project, the flow regime in Alameda Creek downstream of the ACDD would be substantially similar to the modeled baseline flow regime. Wintertime diversions from Alameda Creek to Calaveras Reservoir through the tunnel in above normal and normal years would increase. Wintertime flows in Alameda Creek downstream of the diversion dam in above-normal and normal years would correspondingly decrease compared to the existing and future baseline conditions. However, the change in Alameda Creek flows downstream of the ACDD in these year types would not change substantially. In above-normal years, average annual flows would be conservatively reduced by about 8 percent and in normal years about 3 percent; in those months of reduced flow (December, January, and February), the creek would still experience comparatively large flows in addition to minimum bypasses consistent with the flow release schedules for steelhead. In wet years, where storm events are more frequent, less diversion would typically be required from the ACDD to maintain target reservoir levels, large spills over the ACDD would occur, and minimum bypasses would be higher consistent with flow release schedule A.

Average monthly flow in January of wet years would be conservatively reduced by 8%; however, average annual flows in Alameda Creek in wet years would conservatively increase by about 2 percent. Summertime flows in all year types and wintertime flows in below-normal and dry year types would be greater with the proposed project than under the existing and future baseline conditions.

Table 4.1
Summary Of Alameda Creek Steelhead Habitat Conditions
Under Existing, Future Cumulative Without CDRP, and Future Cumulative with CDRP Scenarios

Alameda Creek Reach (moving upstream)	Existing Condition		Assumed Future Cumulative Condition without CDRP ¹				Assumed Future Cumulative Condition with CDRP ²			
	Stream Condition		Life Stage Habitat Condition ³				Stream Condition			
	(Steelhead do not have access to Alameda Creek above BART weir under the Existing Condition)		Migration	Spawning	Rearing		Migration	Spawning	Reaching	
Lower Alameda Creek (Flow Control Channel) – from San Francisco Bay to mouth of Niles Canyon	Concrete-lined flood control channel BART weir acts as complete barrier to upstream fish passage, ACWD facilities also act as barriers under various flows High summer temperatures Substrate has high silt component Intermittent low flow in summer High winter flows with limited diversion in normal/wet and wet years		PRESENT	ABSENT	ABSENT/ LIMITED		Fish passage restored upstream of BART weir and ACWD inflatable dams No change to habitat conditions in reach CDRP would increase diversions and reduce stream flow in winter months of normal/wet and wet years; minimal change during below normal and dry years	PRESENT	ABSENT	ABSENT/ LIMITED
Extended Study Area										
Niles Canyon – from mouth of Niles Canyon to confluence with Arroyo de la Laguna	Confined channel with steep canyon walls Well-developed riparian zone Low-gradient, perennial stream Large deep pools, connected by run and riffle habitat High summer temperatures Serves as conveyance for water supply from South Bay Aqueduct USGS gage acts as obstacle to fish migration at low flows		PRESENT	PRESENT/ LIMITED	LIMITED		CDRP would increase diversions and reduce stream flow in winter months of normal/wet and wet years; minimal change during dry years	PRESENT	PRESENT/ LIMITED	LIMITED
Extended Study Area										
Upper Alameda Creek (General) – from confluence with Arroyo de la Laguna and upstream	Fish passage limited by Turner Dam, PG&E pipeline crossing, Little Yosemite, Alameda Creek Diversion Dam, Calaveras Dam Spawning and rearing habitat influenced by SFPUC dam operations and releases		(see reach by below)	(see reach by reach below)	(see reach by reach below)		Downstream passage improvements increase potential for migration to upper reaches Fish passage improved at PG&E pipeline crossing but remains limited by Turner Dam, Little Yosemite, Alameda Creek Diversion Dam, Calaveras Dam Spawning and rearing habitat influenced by SFPUC dam operations and releases	(see reach by reach below)	(see reach by reach below)	(see reach by reach below)
Primary Study Area										
A1 – from confluence with Arroyo de la Laguna to lower Sunol Valley (near Sunol WTP)	Wide, low-gradient, alluvial valley Intermittent flows Natural channel relocated due to gravel mining operations "Losing" reach – up to 36% seepage of surface water from Alameda Creek to gravel mining pits, infiltration galleries, etc. Warm-water fish habitat Trout likely not present in reach PG&E pipeline crossing acts as obstacle to fish passage Migration is impeded at several locations due to low-gradient, shallow riffles at low flows		PRESENT	ABSENT	ABSENT/ LIMITED		Downstream passage barriers removed and fish passage restored Historic channel realigned Improved stream flow conditions due to reduced surface and groundwater losses with construction of slurry cutoff walls (but will remain a naturally "losing" reach) Fish passage restored at PG&E pipeline crossing Low-gradient, shallow riffles present within the segment of Alameda Creek adjacent to the Sunol quarry (SMP 30) would be enhanced through restoration of the stream channel associated with Sunol quarry permit renewal Intermittent stream flow Warm-water fish habitat	PRESENT	ABSENT	ABSENT/ LIMITED

Table 4.1
Summary Of Alameda Creek Steelhead Habitat Conditions
Under Existing, Future Cumulative Without CDRP, and Future Cumulative with CDRP Scenarios

Alameda Creek Reach (moving upstream)	Existing Condition		Assumed Future Cumulative Condition without CDRP ¹				Assumed Future Cumulative Condition with CDRP ²			
	Stream Condition	(Steelhead do not have access to Alameda Creek above BART weir under the Existing Condition)	Life Stage Habitat Condition ³				Life Stage Habitat Condition ³			
			Stream Condition	Migration	Spawning	Rearing	Stream Condition	Migration	Spawning	Rearing
A2 – from lower Sunol Valley to confluence with Calaveras Creek	Downstream passage barriers removed and fish passage restored	Confined stream channel Well-developed riparian zone Pool, run, and riffle habitat present Intermittent stream flow in dry years High summer temperatures favor warm-water fish Flows and habitat influenced by Calaveras Dam and Alameda Creek Diversion Dam under DSOD-restricted conditions	Downstream passage barriers removed and fish passage restored	PRESENT	PRESENT	ABSENT/ LIMITED	Downstream passage barriers removed and fish passage restored CDRP implementation would restore historical flow diversions at ACDD to Calaveras Reservoir implement flow release schedules for steelhead; WSIP would include recapture of flows consistent with 1997 MOU improve habitat conditions upstream of recapture facility reduce high winter stream flows in normal/wet and wet years Summer cold-water fish habitat conditions improved in Alameda Creek from the Calaveras Creek confluence to approximately 2-3 miles downstream	PRESENT	PRESENT (improved due to flow release schedules for steelhead)	PRESENT (improved due to flow release schedules for steelhead)
A3 – from confluence with Calaveras Creek to point upstream of Little Yosemite	No projects planned in this reach Downstream passage barriers removed Passage impeded by steep bedrock falls at Little Yosemite	Sleep, confined stream channel Warm- and cold-water fish habitat present Sleep bedrock/falls/ gradient limit fish passage Passage impeded by steep bedrock falls at Little Yosemite Winter and spring stream flow influenced by Alameda Creek Diversion Dam operations, which has increased since DSOD restrictions on Calaveras Reservoir	No projects planned in this reach Downstream passage barriers removed Passage impeded by steep bedrock falls at Little Yosemite	LIMITED, only during peak flows (natural barriers)	PRESENT	LIMITED/ PRESENT	No projects planned in this reach Downstream passage barriers removed Passage impeded by steep bedrock falls at Little Yosemite CDRP implementation would restore historical flow diversions to Calaveras Reservoir and would reduce magnitude and frequency of flows, but bypass flows at diversion dam would provide minimum flows for steelhead	LIMITED (natural barriers)	PRESENT	LIMITED/ PRESENT
A4 – from Little Yosemite to Alameda Creek Diversion Dam	No projects planned in this reach Downstream passage barriers removed	Sleep gradient channel sections impede passage Fragmented habitat under low-flow conditions Dry stream sections in summer Alameda Creek Diversion Dam and Tunnel operations heavily influence flows and habitat conditions	No projects planned in this reach Downstream passage barriers removed	LIMITED, only during peak flows (natural barriers)	PRESENT	LIMITED	No projects planned in this reach CDRP implementation would restore historical flow diversions to Calaveras Reservoir, but bypass flows at diversion dam would provide minimum flows for steelhead Access would remain impeded by the natural barriers	LIMITED (natural barriers)	LIMITED	LIMITED
C1 – Calaveras Creek from confluence with Alameda Creek to Calaveras Dam	No projects planned in this reach No change to future scenario habitat conditions	Deep pool, run, and riffle habitat present Stream flow heavily influenced by Calaveras Dam operations Water temperature influenced by temperature of reservoir releases Habitat values marginal for steelhead due to steep topography, isolated pools, altered stream hydrology Rainbow trout not present (except periodically in spillway stilling basin)	No projects planned in this reach No change to future scenario habitat conditions	ABSENT (barrier at dam)	LIMITED	LIMITED/ ABSENT	CDRP implementation would restore operations of Calaveras Dam and include flow release schedules for steelhead	LIMITED (barrier at replacement dam)	LIMITED	PRESENT

- Notes**
- Future cumulative condition assumes that planned and proposed projects to improve fish passage in the Alameda Creek watershed would be successfully implemented such that anadromous steelhead have access to the upper Alameda Creek watershed, but flow conditions would be the same as existing conditions (Alameda Creek Diversion Dam and Calaveras Reservoir operations with DSOD restrictions)
 - Future cumulative condition assumes that planned and proposed projects to improve fish passage in the Alameda Creek watershed would be successfully implemented such that anadromous steelhead have access to the upper Alameda Creek watershed. In addition, it assumes that the proposed CDRP would be implemented
 - ABSENT denotes habitat not present in reach to support life stage, LIMITED denotes habitat present to support life stage during periods of the year, but limited by seasonal low flows and/or high summer temperatures, marginally suitable, PRESENT denotes habitat present to support life stage. N/A = Not Applicable, i.e., not affected by CDRP because barriers (Calaveras Dam and ACDD) would remain

Similar to baseline conditions, flows downstream of the ACDD would be greatest in the winter months of wetter years, and flows would be small or nonexistent in the summer months of all years and the winter months of drier years. Peak flow spills, although reduced in some months or portions of months, would still occur at other times, similar to baseline conditions, as shown by the modeling of several months of 15-minute peak flow gage data. The number of months when completely dry conditions occur in Alameda Creek downstream of the diversion dam would be reduced with the proposed project due to bypass flows consistent with the proposed flow release schedules for steelhead. The proposed project would not substantially change the range of flows in Alameda Creek downstream of the diversion dam, with the exception of the elimination of completely dry conditions in many months, which would be beneficial, and the passage of peak flow events due to implementation of the ACDD Operations Plan. Modeling over all year types, in the long term, shows that the proposed project would increase total flows in Alameda Creek by about 7 percent. This is largely the result of substantial increases in flows in below-normal and dry years.

In summary, implementation of the proposed project would modify the current operation of the ACDD diversion, but would ensure that flow schedules for steelhead would be bypassed as described earlier. Diversions from Alameda Creek to Calaveras Reservoir during the baseline period did not include any predictable bypass flows for fish species. The proposed project would include minimum bypass flows up to 20 cfs (during spawning periods) in 20 percent of the years and bypass flows/dam releases up to 42 cfs (during spawning periods) (Schedule A) during 20 percent of the years (see Figure 1.4: Proposed Steelhead Flow Schedules).

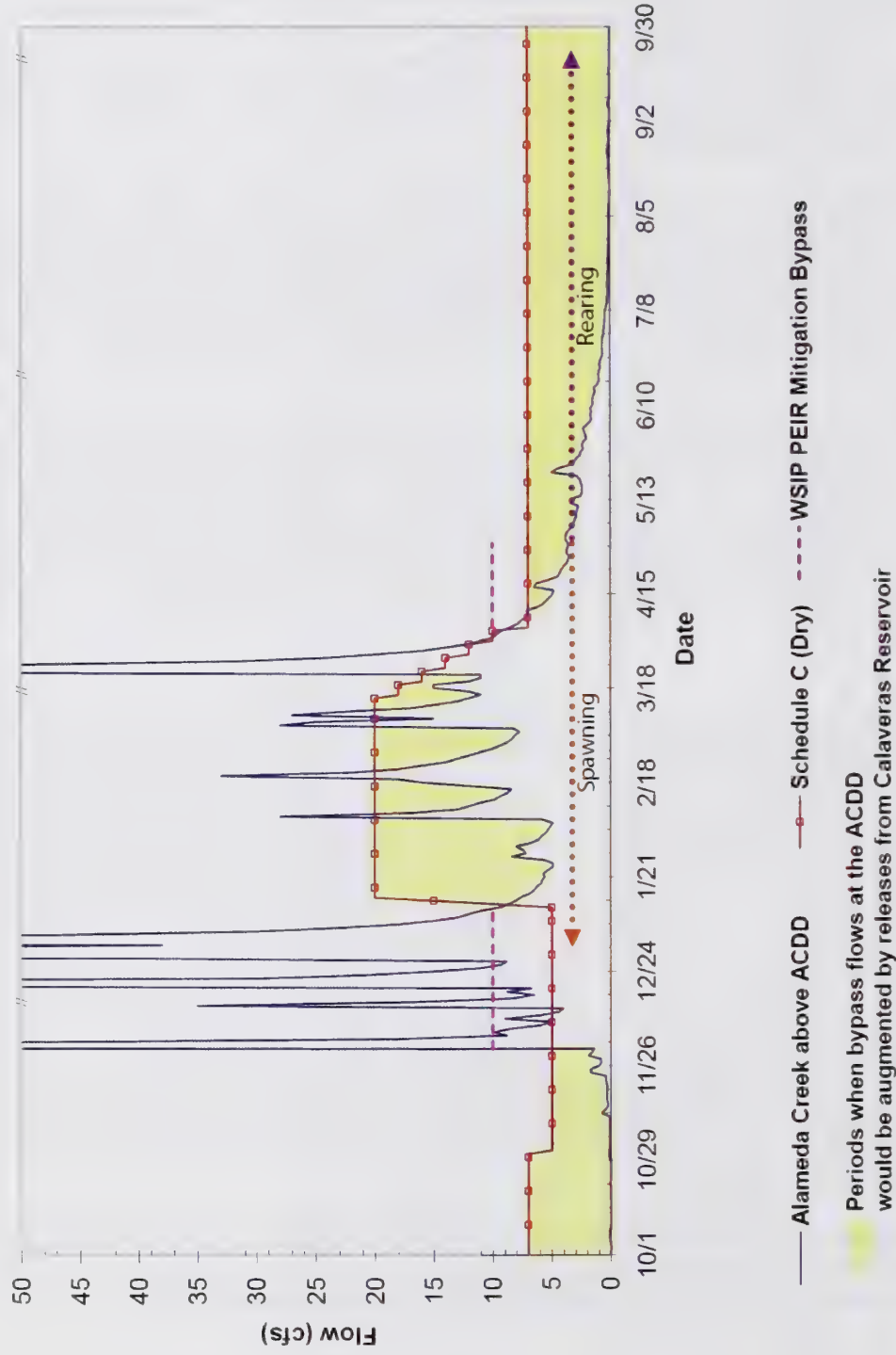
Figures 4.1a, 4.1b, and 4.1c compare the proposed flow schedules to unimpaired hydrology in Alameda Creek immediately above the ACDD for dry, normal, and wet years. Based on historical flows measured at the Alameda Creek gage located above the ACDD, daily maximum flows in Alameda Creek would be expected to continue to exceed the 650 cfs capacity of the diversion tunnel (see Figure 4.2, Maximum Daily Flows in Alameda Creek above the ACDD). As illustrated in Figure 4.2, these flows exceeded 1,500 cfs in 7 of the 14 years and while reduced compared to unimpaired conditions, periodic peak flows passing over the ACDD combined with the proposed minimum bypass flow schedules would contribute to more reliable migration and spawning habitat conditions downstream.

A) Migration

The proposed action would not change the baseline conditions relative to physical impediments to steelhead migration at the ACDD. In addition to the ACDD barrier, the Little Yosemite section of upper Alameda Creek (located just upstream from the confluence of Alameda and Calaveras creeks) is a natural impediment to potential adult steelhead immigration. This section is located in a 0.2-mile, high-gradient, bedrock section of stream channel. Two features within Little Yosemite, one 7.9-foot waterfall and one 9.5-foot waterfall, were found to be impassable during field assessments at low and moderate flows due to vertical height (URS and HDR, unpublished data). While the two features are likely barriers to steelhead immigration during low and moderate flows, there is uncertainty regarding the passability of the Little Yosemite reach under extremely high flows. High flows with potential to change the passability of Little Yosemite occur during or immediately following storms (see Figure 4.2). Such flows may make some of the features evaluated more easily passable, by creating additional flow paths around obstacles; however, these peak flows can be short in duration with one or several events occurring over a single year (see Figure 4.3). Further, water velocity and turbulence also increase with flow, so some of the features evaluated may become less passable. It is unknown whether steelhead would be able to successfully immigrate through the entire Little Yosemite reach during one of the brief, extreme flow events that occur during some years, without succumbing to exhaustion. The proposed CDRP would not result in any physical changes to these features.

As stated above, the CDRP would provide more stable and reliable flows for future steelhead immigration relative to the baseline conditions. Daily peak flows, while reduced in magnitude compared to unimpaired peak flows, would continue to exceed the diversion capacity of the ACDD (based on historical

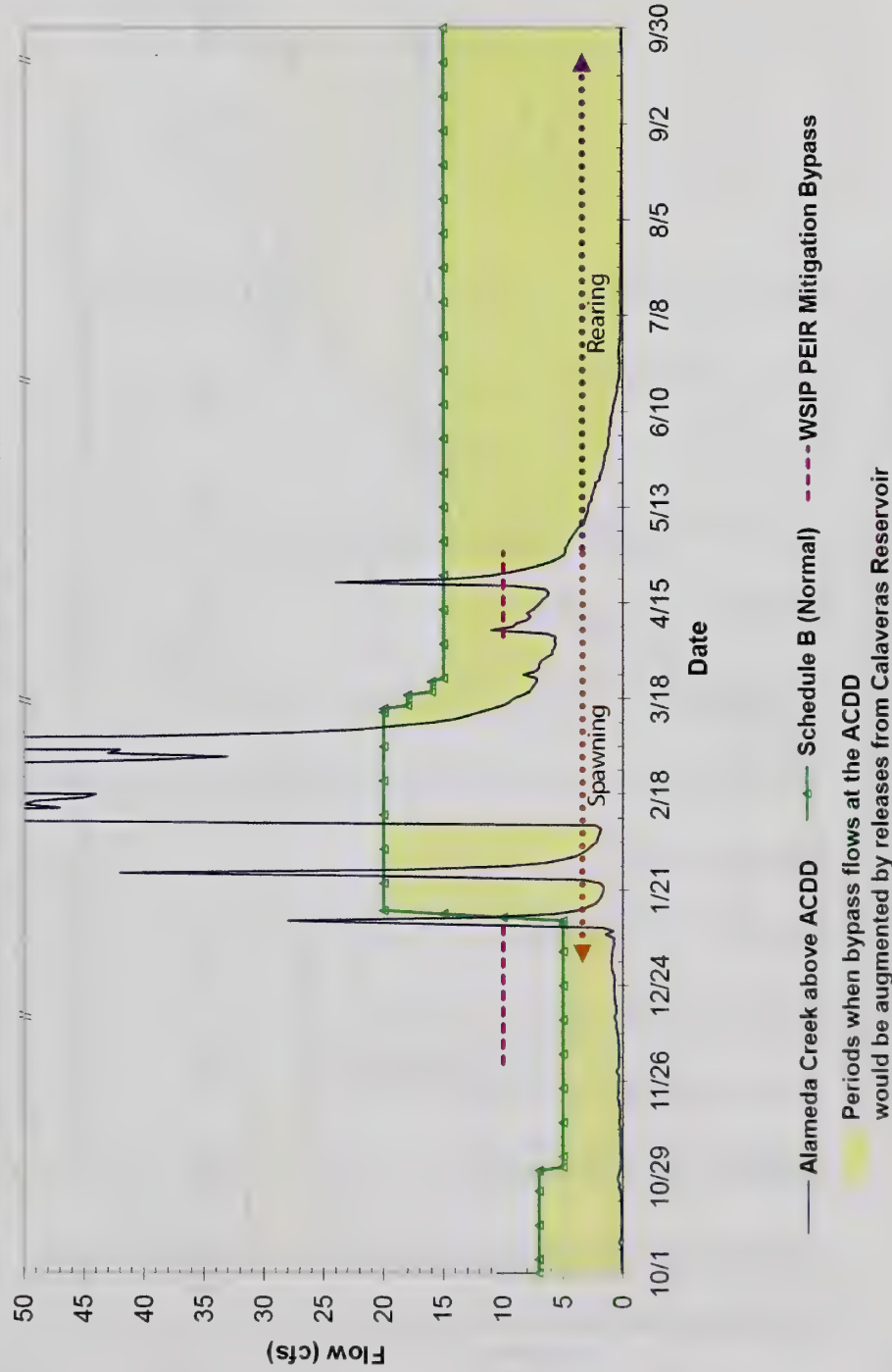
**SFPUC Proposed Instream Flow Schedule and
Mean Daily Flow at Alameda Creek above ACDD
Water Year 2002 - Dry Year Type**



Source: USGS gage 11172945; compiled by ETJV

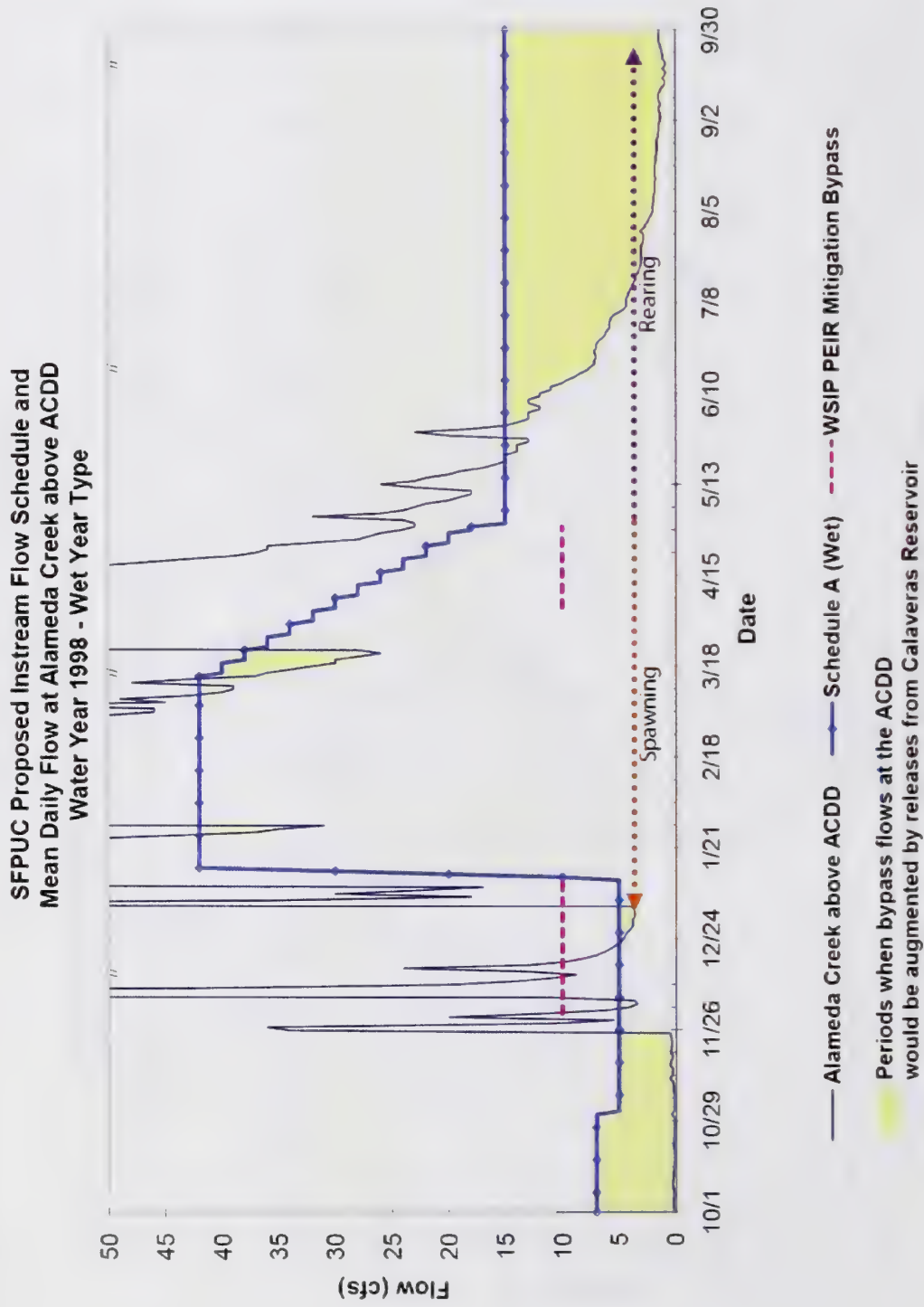
Figure 4.1a: Proposed Flow Schedule C (1997 MOU) with ACDD Hydrology (2002 - Dry)

SFPUC Proposed Instream Flow Schedule and Mean Daily Flow at Alameda Creek above ACDD Water Year 2001 - Normal Year Type



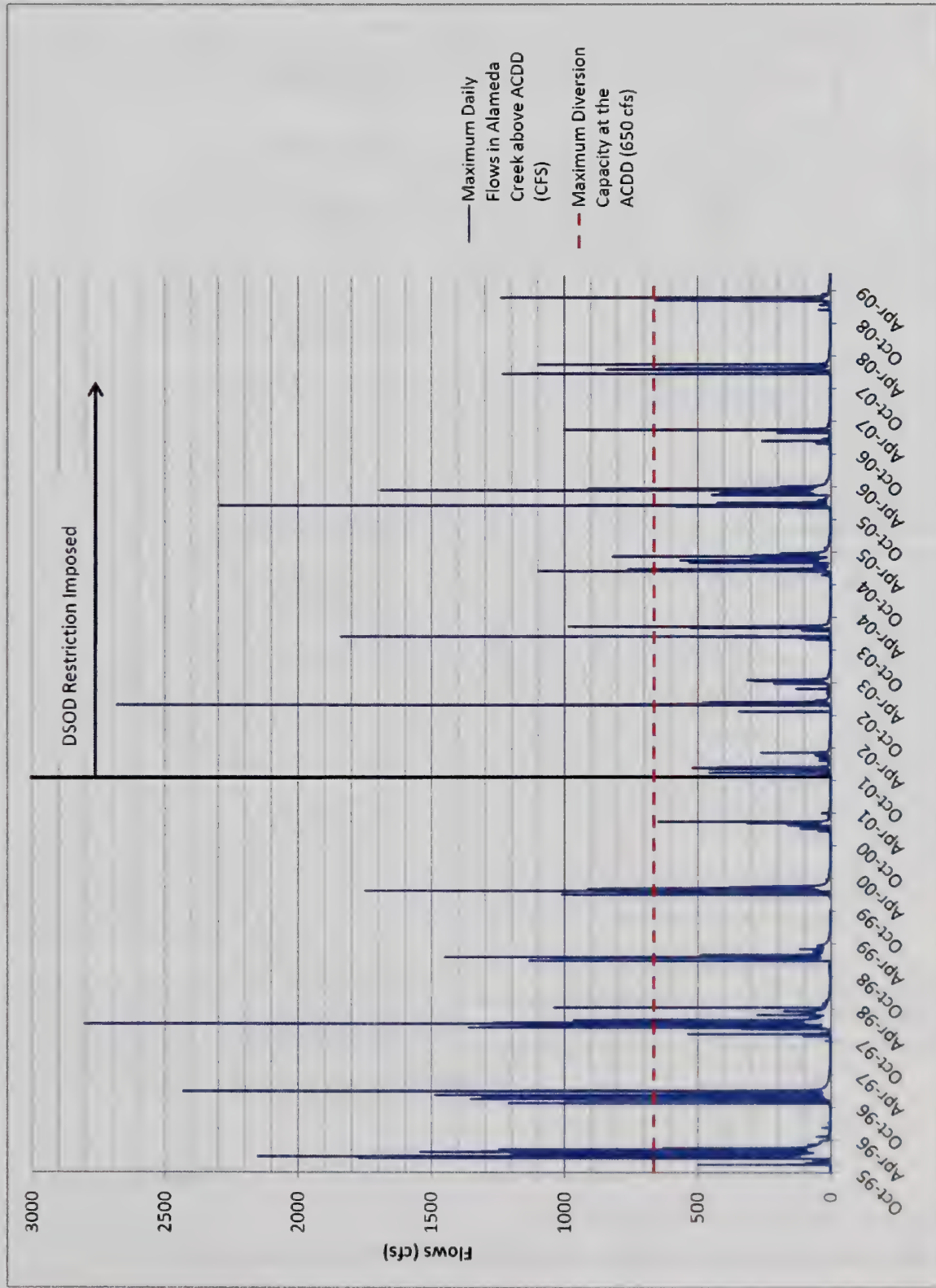
Source: USGS gage 11172945; compiled by ETJV

Figure 4.1b: Proposed Flow Schedule B with ACDD Hydrology (2001 - Normal)



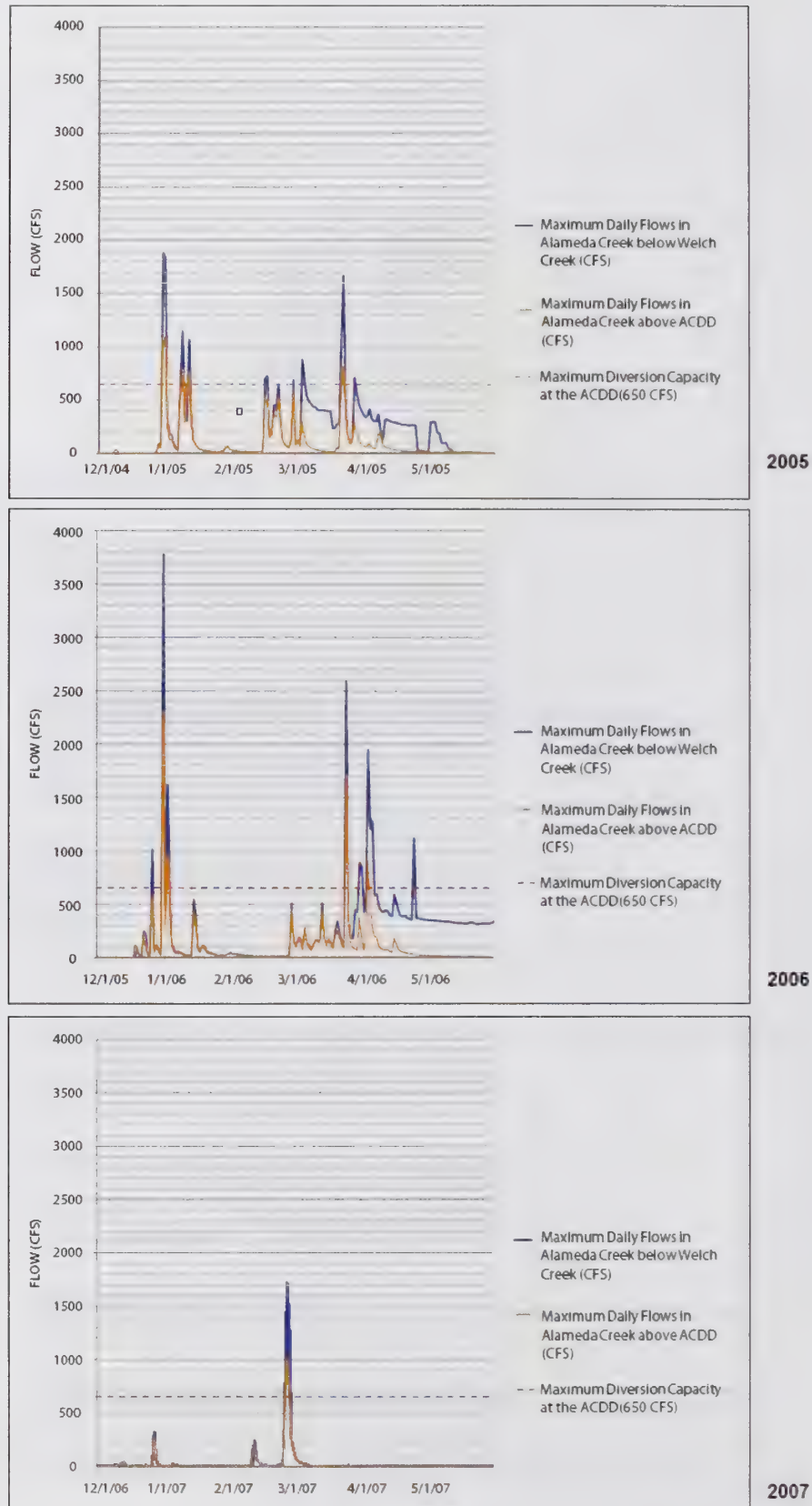
Source: USGS gage 11172945; compiled by ETJV

Figure 4.1c: Proposed Flow Schedule A with ACDD Hydrology (1998 - Wet)



Source: USGS gage, 11172945; compiled by ETJV

Figure 4.2: Daily Maximum Flows in Alameda Creek Above the Alameda Creek Diversion Dam



Source: USGS gages 11172945 and 11173575; compiled by ETJV

Figure 4.3: Daily Maximum Flows in Upper Alameda Creek (2005, 2006, and 2007)

data, see Figures 4.2 and 4.3); these remaining periodic peak flows, which, based on past records, would be expected to exceed 600 to 1,000 cfs on a regular basis, combined with minimum bypass flows, would provide important pulse and base flows necessary for the maintenance of a functioning downstream migration corridor. Further, the periodic peak flows would maintain aquatic habitat conditions through geomorphic processes.

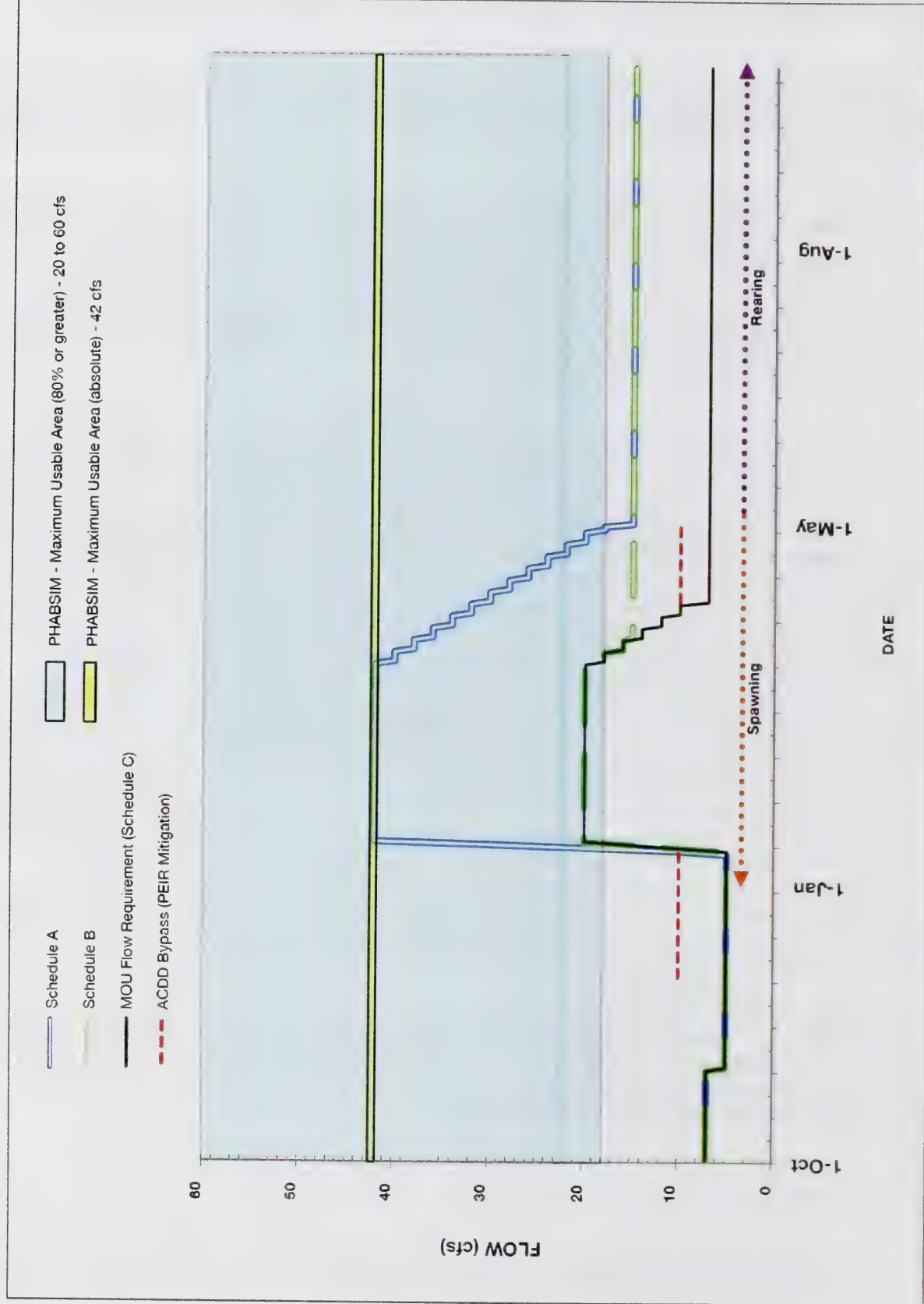
B) Spawning

Studies recently completed by Hagar Environmental Sciences and Thomas R. Payne and Associates (ETJV 2008) identified suitable habitat for steelhead spawning in the reach of Alameda Creek immediately downstream of the Calaveras Creek confluence (Reach A-2) and between the Calaveras Creek confluence and the diversion dam (Reaches A-3 and A-4).

Upstream of the Calaveras Creek confluence, Alameda Creek flows are predominantly influenced by operation of the diversion dam and tunnel. Alameda Creek between the diversion dam and the confluence with Calaveras Creek at present provides habitat for spawning resident rainbow trout as well as other native species. As discussed above, passage conditions are extremely limited under most flow conditions at Little Yosemite and likely would impede steelhead access to the majority of this reach most of the time; therefore, project-related effects on steelhead spawning are more practically realized in Alameda Creek downstream of Little Yosemite under most years/periods. Nevertheless, bypass flows at the ACDD would provide suitable habitat conditions for spawning in this reach when natural flows are present.

Physical habitat simulation (PHABSIM) modeling studies by Hagar Environmental Sciences and Thomas R. Payne and Associates (ETJV 2008; Appendix A) to assess flow requirements for steelhead spawning indicate that flows in Alameda Creek between the ACDD and the Calaveras Creek confluence in the range of 18 to 60 cfs provide the *most* suitable quantity and quality of steelhead spawning habitat (see Figure 4.4). According to the model, flows in this range would provide 80 percent or greater of maximum usable area based on the relationship between stream flow and spawning habitat requirements i.e., water depth, flow velocity, and substrate type and size. Spawning flows in Alameda Creek would be most effective if implemented from approximately January through March, and based on different water year types and aligned with the timing of precipitation in the upper watershed. The 1997 MOU flows (schedule C) ranges up to 20 cfs and thus are at or near the lower range for the most suitable quantity and quality for steelhead. Flow schedule A would provide 42 cfs during the primary spawning period, provides the most suitable habitat quantity and quality for steelhead (see Figure 4.4), and helps to more closely mimic the natural hydrograph by occurring during naturally wet year-types. Under the CDRP, bypasses from the Alameda Creek Diversion Dam and/or water releases from Calaveras Dam consistent with the flow schedules for steelhead would contribute to steelhead spawning habitat conditions (20 cfs from January to March) within the reach of Alameda Creek that extends from the ACDD downstream through Reach A-2 (the extent of suitable spawning habitat). While the 1997 CDFG MOU (schedule C) was developed to address habitat needs for rainbow trout, it would also be expected, based on the Hagar and Payne PHABSIM study (ETJV 2008, Appendix A), to provide spawning habitat functions for steelhead. Implementation of instream bypass flows consistent with the flow schedules for steelhead (see Figure 1.4 and Figure 4.4: Proposed Steelhead Flow Schedules with PHABSIM Modeling Results) (when naturally present), represent improved conditions relative to the environmental baseline and would contribute to improved habitat functions for steelhead spawning (through the creation of more stable and reliable conditions) in Alameda Creek from the ACDD downstream.

After spawning, the eggs incubate within the gravel and hatch about 19 to 80 days later at water temperatures ranging from 15.5°C to 4.5°C, respectively (warmer water temperatures result in shorter incubation times). The average incubation period is approximately 4–6 weeks. After hatching, the young fish (alevins) remain in the gravel for an additional 2–6 weeks before emerging from the gravel and taking up residence in the shallow margins of the stream where they feed primarily on insects.



Source: ETJV 2008; SFPUC unpublished data

Figure 4.4: Proposed Steelhead Flow Schedules with PHABSIM Modeling Results

Survival of fertilized eggs through hatching and emergence from the gravel can be limited by large changes in flow. For example, high flows during storm events can result in excessive water velocities that scour spawning areas and dislodge eggs from the substrate or cause fine sediments to be deposited on the redds where it smothers the eggs. Flow reductions during the incubation period can cause inadequate intra-gravel flow and desiccation of eggs and larvae. The increased diversion of higher flows up to about 650 cfs at the diversion dam could provide a benefit in above-normal and wet years by reducing the likelihood that steelhead eggs incubating in redds downstream of Little Yosemite would be vulnerable to scour and erosion. As such, in some years the increased diversion that would occur with the CDRP has the potential to contribute to improved reproductive success of any steelhead spawning within the reach. A suitable base level of flow ranging from 7 cfs to 42 cfs, depending on water year and time period (through the flow schedules for steelhead), would be available for spawning and egg incubation (ETJV 2008). Together, the spawning flows (20 to 42 cfs) and the subsequent rearing flows (7 to 15 cfs) would be anticipated to provide suitable hydrologic and interstitial conditions to support spawning, egg incubation, and emergence of alevins.

Additionally, project operations could contribute to an adverse effect on steelhead spawning if rapid or sudden increases or decreases in high peak flows occur during the spawning period. Rapid or sudden changes in high flow peaks can have detrimental effects by mobilizing (e.g., scouring and deposition) or desiccating (e.g., dewatering) stream substrate after spawning has occurred, with the result that eggs would be washed away or smothered or dried or be exposed to unsuitable temperature or water quality conditions. This potential effect would be addressed through the implementation flow ramping and the provision of base (minimum) rearing flow bypasses/releases consistent with the flow schedules for steelhead (minimum of 7 cfs from March 16 through October 31) whenever these flows are naturally present. This would represent a beneficial effect to steelhead spawning and egg incubation relative to baseline conditions.

C) Rearing

Steelhead rearing habitat in the reach of Alameda Creek between the diversion dam and the Calaveras Creek confluence could be adversely affected during the rainy season (i.e., approximately November through March) (Reaches A-3 and A-4). Implementation of bypass flows would reduce effects of the CDRP on future occurring steelhead in this reach and improve habitat quality relative to existing conditions. Diversions at ACDD are unlikely during the dry season when there is minimal naturally occurring flow in Alameda Creek (i.e., May through November) because the low flows during this period would not reach the invert elevation of the diversion tunnel. This condition would be similar to the current existing condition. Summer habitat conditions would continue to provide limited steelhead rearing conditions within the range of variability that exists with natural summer flow and temperature conditions.

Alameda Creek below the Calaveras Creek Confluence to Arroyo de la Laguna Confluence

Flow immediately downstream of the confluence of Alameda and Calaveras Creeks is the sum of flow in the two creeks upstream of the confluence. Under existing and future baseline conditions, streamflow in Alameda Creek downstream of the Calaveras Creek confluence is regulated by Calaveras Dam and the ACDD. Flows in this reach of the creek are not reflective of a natural hydrograph but are instead highly dependent on operation of the ACDD and the dam. Unregulated watershed runoff and seepage beneath and around Calaveras Dam and the ACDD contribute to flows in this reach of the creek but in a much smaller proportion compared to water released from Calaveras Reservoir and spilling over the ACDD.

Flow in Alameda Creek downstream of its confluence with Calaveras Creek would reflect the proposed project-caused changes in flow in Alameda Creek downstream of the diversion dam and in Calaveras Creek downstream of Calaveras Reservoir. Wintertime flows in Alameda Creek downstream of the confluence in wetter year types would be less than under existing conditions. Flow in the creek in the summer months would be increased and would never fall below 7 cfs.

As described in Section 4.6 of the EIR (see Table 4.6.20 and Figures 4.6.15a, 4.6.15b, 4.6.14a, and 4.6.14b), the flow regime in Alameda Creek downstream of its confluence with Calaveras Creek with the proposed project in place would be substantially similar to the existing flow regime. Flows would be greatest in the winter months of wetter years, and flows would be small in the summer months of all years and the winter months of drier years. Peak flows, though reduced at some times, would be similar to those under the existing condition and could be

increased when uncontrolled spills occur over the Calaveras Dam spillway. In contrast with the completely dry conditions that occur at times, with the proposed project, there would always be some flow in Alameda Creek downstream of its confluence with Calaveras Creek. The proposed project would not substantially change the range of flows in Alameda Creek downstream of the confluence, with the exception of the elimination of completely dry conditions in summer (due to the flow release schedules), which would be beneficial and the passage of peak flow events due to implementation of the ACDD Operations Plan.

These flows would be further increased with the implementation of the proposed flow schedules A and B during wet and normal water-year type classes (per monthly cumulative flow calculations in Arroyo Hondo). Overall, these changes would result in more reliable and stable rearing habitat conditions compared to the baseline condition. Figure 4.5, Daily Maximum Flow in Alameda Creek below the Welch Creek Confluence (1999-2009), presents daily maximum flow data for Alameda Creek below the Welch Creek confluence. As shown in the figure, flows at this location exceeded 2,000 cfs in six of the ten years over the period of record. These flows include unimpaired contributions from upper Alameda Creek during periods when diversion were not being made at the ACDD (spring of 2005, 2006, and 2007), impaired contributions from upper Alameda Creek during periods when diversion were being made (spring of 2003, 2004, and 2008), inflows from local tributaries, and periodic cone valve releases from Calaveras Dam (02/24/00 – 03/30/00, 12/2001 - 02/2002, 03/2005 - 05/2005, 03/2006 - 06/2006) (see also Figures 3.1, 4.2, 4.3, and 4.5). Based on the historical records, it is anticipated that periodic peak flows would continue to occur in Alameda Creek in the Sunol Valley even with regular diversions taking place.

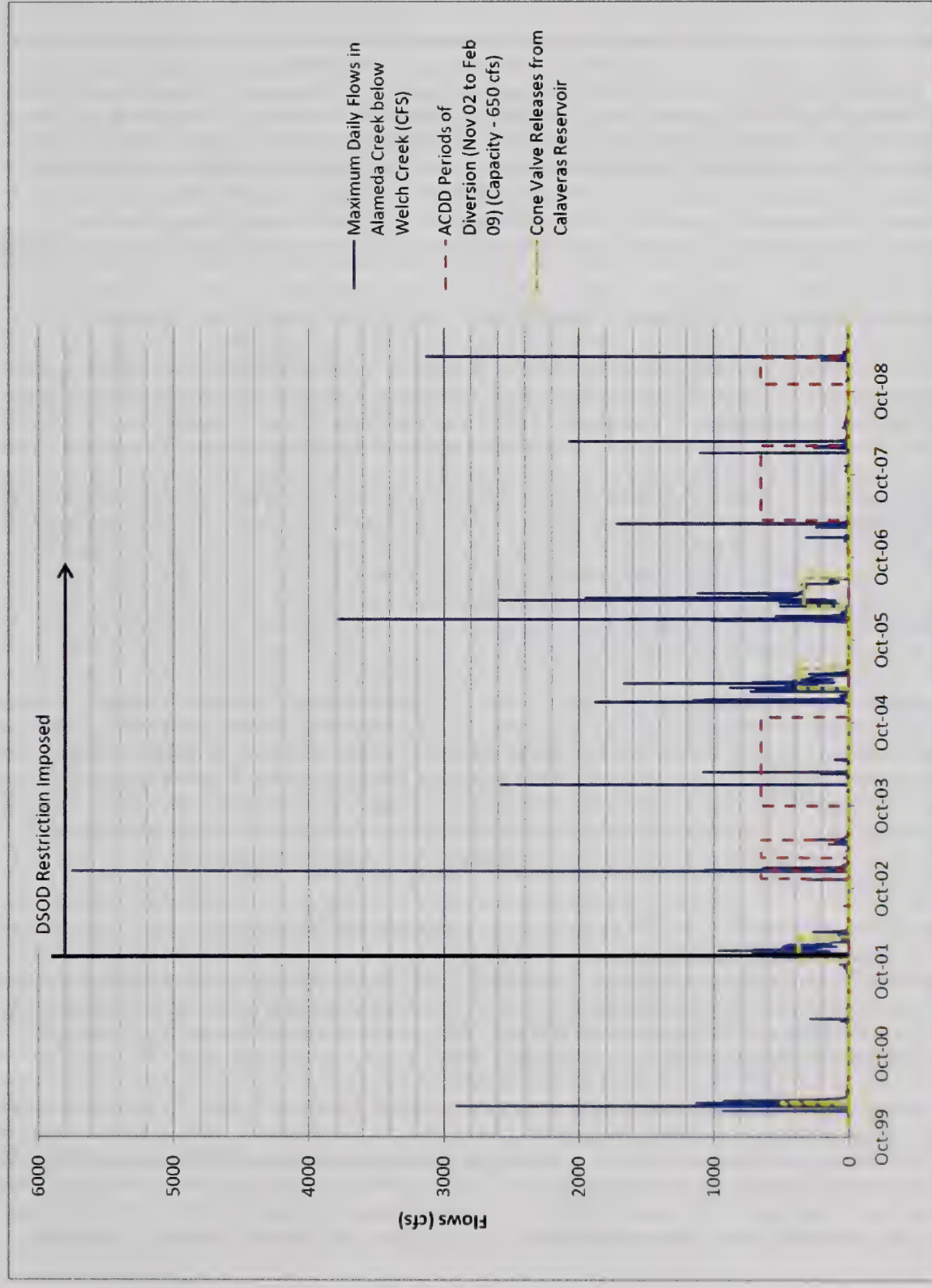
A) Migration

Construction of the proposed replacement dam immediately downstream of the existing Calaveras Dam would continue the presence and effects of the existing dam, which is a long-standing barrier to fish migration. Therefore, implementation of the proposed CDRP would result in no change to baseline conditions relative to steelhead migration at the Calaveras Dam.

In the Sunol Valley (Reaches A-1 and A-2), there are several wide channel areas where riffles may limit steelhead passage at lower flows (described above) under pre- and post-DSOD restricted conditions. Flows consistent with the proposed flow schedules for steelhead would improve migration conditions at riffles and other “natural” migration obstacles (assuming human-caused barriers are removed) in the Sunol Valley. Steelhead migration assessments were conducted at 10 representative riffles primarily in lower portion of Reach A-1 (stream reach adjacent to the Sunol Quarry [SMP-30]) (URS and HDR, unpublished data). Stage versus discharge relationships were developed from a limited range of field measurements (1 to 3 surveys per riffle) and a combination of linear interpolation and linear extrapolation was used to estimate flows expected to meet criteria for future steelhead migration at the subject riffles. For the portion of the reach that was studied, the instream flow estimates for passage at the subject riffles range from 1 to 46 cfs for adults and 1 to 12 cfs for juveniles.

The flow assessment results suggest that fish passage at the subject riffles could be enabled through the provision of minimum instream flows approximately equal to the highest passage flow estimate (i.e., 46 cfs for adults and 12 cfs for juveniles) or through physical modification of the creek channel at critical riffle locations to improve the specific conditions (e.g., wide or braided channel, shallow depths, etc.) that impede future fish passage. Restoration of these sites would, in general, reduce minimum fish passage flows to levels that would be sufficient for passage at other, less limiting riffles present in this reach.

CDRP implementation would include the implementation of bypass flows consistent with the proposed flow schedules for steelhead and the Operations Plan for the ACDD, which would improve migration habitat conditions for future occurring steelhead relative to the existing and future baseline conditions. As discussed above, daily peak flows would be expected to continue to exceed the diversion capacity of the ACDD (based on historical data, see Figures 4.2 and 4.3) and continue downstream in Alameda Creek. These events are illustrated by the peak flows observed at the gage near Welch Creek approximately 6.75 miles downstream of ACDD (see Figure 4.5). These periodic peak flows would provide important pulses necessary for fish movement and the maintenance of aquatic habitat conditions through geomorphic processes downstream through the Sunol Valley. Further, implementation of the Operations Plan for the ACDD would also result in the passage of peak flows (see EIR Figure 4.6.14a and 4.6.14b).



Source: USGS gage 11173575, SFPUC unpublished data; compiled by ETJV

Figure 4.5: Daily Maximum Flow in Alameda Creek below the Welch Creek Confluence (1999-2009)

In summary, the periodic peak flows combined with the minimum bypass flows would provide important pulse and base flows necessary for maintenance of a functioning downstream migration corridor through the Sunol Valley consistent with the steelhead migration requirements. Further, the periodic peak flows would maintain aquatic habitat conditions through geomorphic processes.

B) Spawning

As stated above, studies recently completed by Hagar Environmental Sciences and Thomas R. Payne and Associates (ETJV 2008) identified suitable habitat for steelhead spawning in the reach of Alameda Creek immediately downstream of the Calaveras Creek confluence (Reach A-2). Calaveras Dam has altered stream flows during potential steelhead spawning periods. Implementation of the CDRP would continue to alter flows, however, project-related effects would be reduced through implementation of the proposed minimum flows consistent with the flow schedules for steelhead, and revised cone valve testing protocol that minimizes the effects of testing during the spawning season. Although these flow alterations would be minimized through implementation of the proposed bypass flows, and in consideration of potential future projects that include restoration of fish passage in lower Alameda Creek, the proposed CDRP could affect future occurring steelhead spawning.

PHABSIM modeling studies by Hagar Environmental Sciences and Thomas R. Payne and Associates (ETJV 2008; Appendix A) to assess flow requirements for steelhead spawning indicate that flows (for Alameda Creek downstream of the Calaveras Creek confluence) in the range of 21 to 80 cfs provide the *most* suitable quantity and quality of steelhead spawning habitat (see Figure 4.4). The same modeling indicated that a flow of 42 cfs provides the maximum suitable quantity and quality of steelhead spawning habitat. Spawning flows in Alameda Creek would be most effective if implemented from approximately January through March, and based on different water year types and aligned with the timing of precipitation in the upper watershed. The minimum flow release schedule C (dry water year type) ranges up to 20 cfs and thus is at or near the lower range noted above for the most suitable quantity and quality for steelhead. Based on the Hagar and Payne PHABSIM modeling study (ETJV 2008, Appendix A), the minimum flow schedule would provide spawning habitat functions for steelhead. Proposed flow schedule A (wet water year type) would provide flows up to 42 cfs during the primary spawning period that would further increase the spawning habitat available for steelhead. The implementation of instream flow schedules for steelhead represent improved conditions relative to the environmental baseline and would contribute to improved habitat functions for steelhead spawning in Alameda Creek.

As discussed above, after spawning the eggs incubate within the gravel and hatch in approximately 4–6 weeks. After hatching, the young fish (alevins) remain in the gravel for an additional 2–6 weeks before emerging from the gravel and taking up residence in the shallow margins of the stream where they feed primarily on insects. Survival of fertilized eggs through hatching and emergence from the gravel can be limited by large and rapid changes in flow. For example, high flows during storm events can result in excessive water velocities that scour spawning areas and dislodge eggs from the substrate or cause fine sediments to be deposited on the redds where it smothers the eggs. Flow reductions during the incubation period can cause inadequate intra-gravel flow and desiccation of eggs and larvae.

The increased diversion of higher flows up to about 650 cfs at the diversion dam could provide a benefit in above-normal and wet years by reducing the likelihood that steelhead eggs incubating in redds downstream of the ACDD would be vulnerable to scour and erosion. As such, in some years the increased diversion that would occur with the CDRP would be expected to contribute to improved reproductive success of any steelhead spawning within the reach, provided that a suitable base level of flow (through flow schedules for steelhead) would be available for spawning and egg incubation (ETJV 2008).

Additionally, project operations could contribute to effects on steelhead spawning if rapid or sudden increases or decreases in high peak flows occur during the spawning period. As discussed above, rapid or sudden changes in high flow peaks can have detrimental effects by mobilizing (e.g., scouring and deposition) stream substrate after spawning has occurred, with the result that eggs would be washed away or smothered and that redds possibly would be destroyed or damaged. This potential effect would be addressed through the implementation of flow ramping and minimum rearing flow bypasses/releases (7 cfs from March 16 through October 31). Because

ramping criteria and minimum flow bypasses/releases currently do not exist, this represents a beneficial effect to steelhead spawning and egg incubation relative to baseline conditions.

A suitable base level of flow ranging from 7 cfs to 42 cfs, depending on water year and time period (through the flow schedules), would be available for spawning and egg incubation (ETJV 2008). Together, the spawning flows (20 cfs to 42 cfs) and the subsequent rearing flows (7 to 15 cfs) would be anticipated to provide suitable hydrologic and interstitial conditions to support spawning, egg incubation, and emergence of alevins consistent with the steelhead spawning requirements.

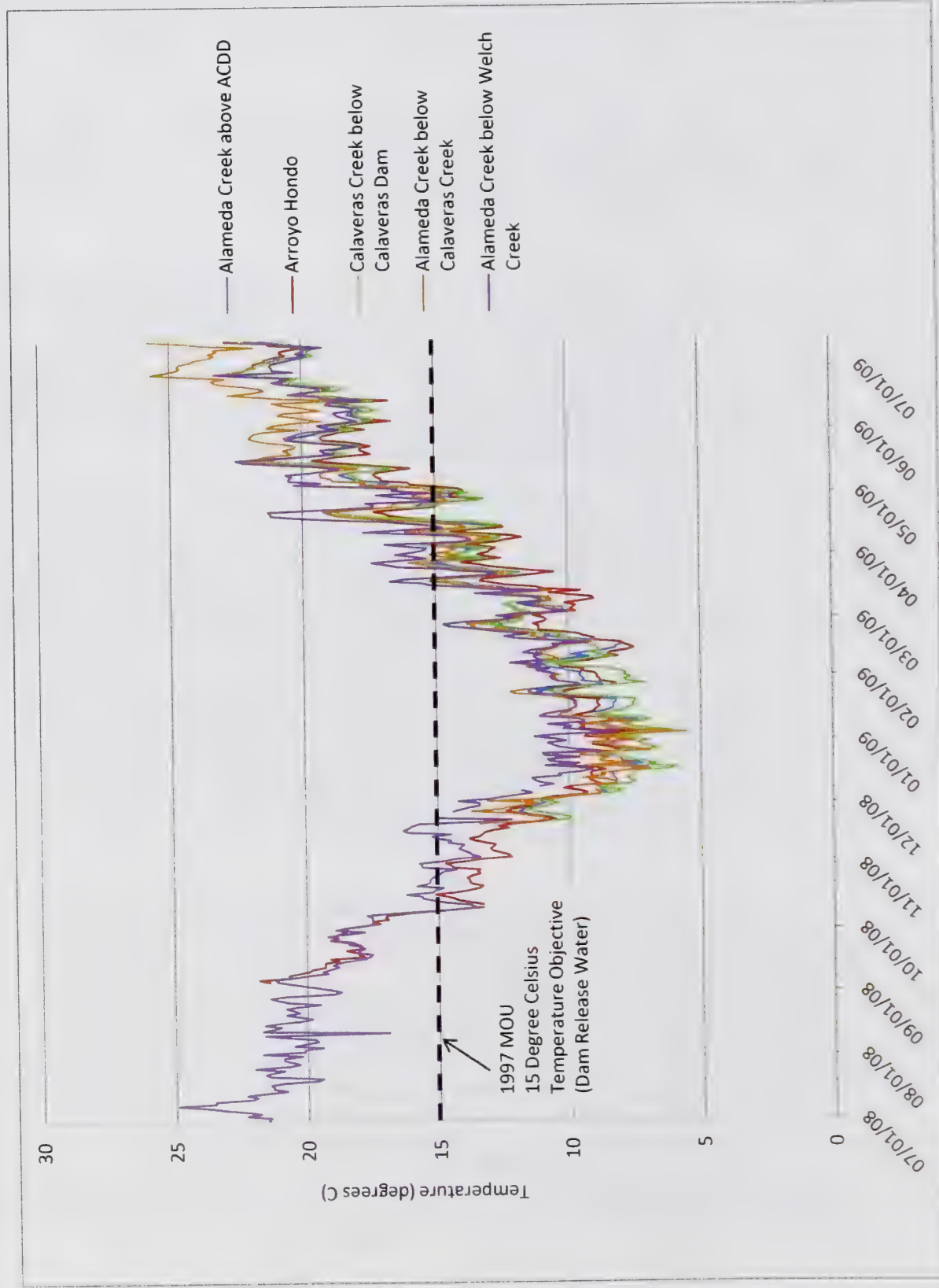
The completion of the HCP, which is being developed in consultation with the USFWS, NMFS, and CDFG, would include adaptive management measures to ensure the habitat requirements of steelhead and other native aquatic species (fish and sensitive amphibians) in the Alameda Creek watershed are being met over the long-term based on the primary constituent elements (as described above) required for steelhead.

C) Rearing

Restoration of historical reservoir conditions will improve water quality parameters in Calaveras Reservoir, which in turn may beneficially affect fish habitat conditions in Alameda Creek. Under the proposed project, Calaveras Dam would be replaced and the reservoir's historic capacity would be restored. Compared with existing conditions, the reservoir would be maintained at a higher storage level. In addition, the new dam outlet works would allow greater flexibility to manage both in-pool and downstream conditions by providing a wider range of controlled releases, selective withdrawal, and improved spill management. Thus, effects to water quality in the reservoir and downstream in Calaveras and Alameda creeks associated with restoration of pre-DSOD reservoir conditions and new dam outlet works would be beneficial relative to existing conditions.

The flow release schedules were developed, in part, to provide an increase in the amount of cold-water habitat in a 2-mile reach of Alameda Creek downstream of the Calaveras Creek confluence. This is especially important in the summer and fall periods, at which times the releases would provide sufficiently cool water that would support fish survival through the hot dry summer period, with releases from Calaveras Reservoir at or below 15 degrees Celsius. Therefore, under the CDRP, minimum releases (schedule C) from Calaveras Dam during the summer period that meet flow and temperature objectives would be expected to improve existing conditions and provide suitable habitat for rearing steelhead in Alameda Creek from the Calaveras Creek confluence downstream to the Sunol Regional Park boundary (i.e., segment of creek where sufficiently cool water temperatures could be maintained before warming [CDFG 1997]) (see Figure 4.5.1). Further, the proposed flow schedules A and B would provide increased cold-water releases of 15 cfs (double that of the MOU rearing flow) during the critical summer period in normal and wet water-year types (as defined by calculation of cumulative monthly stream flows at the Arroyo Hondo gage). The increased cold water flow releases would improve the quality and increase the quantity of summer rearing habitat for future occurring steelhead downstream to SVWTP/Welch Creek confluence, which would address a critical limiting factor for salmonid production in coastal streams.

The ability to manage stream water temperatures with the restored Calaveras Reservoir cold-water pool would not only provide a beneficial effect compared to existing conditions, but would also result in an enhancement compared to historic unimpaired conditions as measured upstream of the reservoir in Arroyo Hondo and upstream of the ACDD in Alameda Creek. Figure 4.6: Real-time Water Temperatures in the Upper Alameda Creek Watershed, shows that water temperatures at both of these locations can exceed 20°C, which is 5 degrees above the temperature criteria for releases from Calaveras Reservoir. The proposed flow schedule will consistently provide release water temperatures of 15°C, which is a highly suitable temperature for rearing. Providing flows of this temperature may not be possible under current conditions without the project, because there may not be adequate cold-water pool in Calaveras Reservoir upon which to draw during the summer months.



Source USGS gages 11172945, 1117300, 11173500, 11173510, and 11173575; compiled by ETJV

Figure 4.6: Real-time Water Temperatures in the Upper Alameda Creek Watershed

Habitat conditions downstream of the bridge at the Sunol Valley WTP (Reach A-1) do not appear to be suitable for steelhead rearing. Annual fish monitoring from 1998 to present (conducted by SFPUC; summarized in ETJV 2008) resulted in very few rainbow trout being sampled or observed at locations immediately above this reach. With assumed construction of a slurry cutoff wall adjacent to the aggregate quarries (identified as a potential future project), downstream losses in stream flow resulting from percolation of groundwater in the Sunol Quarry (SMP 30) area would be reduced, representing a beneficial effect to potential future occurring steelhead. However, remaining losses in stream flow and the capture efficiency of a future cutoff wall at the Sunol Quarry (SMP 30) are unknown. Therefore, while the future viability of steelhead rearing habitat in the Sunol Valley is still uncertain, releases/bypasses included under the CDRP consistent with the flow schedules could result in limited seasonal enhancements to rearing habitat conditions for steelhead (i.e., late spring and late fall when water temperatures remain sufficiently cool) relative to baseline conditions. As discussed above, improved conditions associated with the proposed project would be primarily realized in the approximate 2-mile reach of Alameda Creek between the Calaveras Creek confluence and the Sunol Regional Park boundary and further downstream to the SVWTP/Welch Creek confluence during wet years.

In summary, the restored Calaveras Reservoir (and associated cold water pool) combined with flow schedules that include temperature criteria for release water would result in improved rearing conditions consistent with steelhead rearing requirements, especially during summer periods that are naturally limited due to flows and temperatures. These improved habitat conditions would be anticipated to result in increased steelhead densities with individuals that are able to achieve high growth rates prior to becoming smolts, which is critical to overall life history success (McBain and Trush 2008).

Calaveras Creek Below Calaveras Dam

At present, streamflow in Calaveras Creek downstream of Calaveras Dam is regulated by the existing dam and reservoir. Flows in this reach of the creek are not reflective of a natural hydrograph but are instead highly dependent on water released from Calaveras Reservoir. Unregulated watershed runoff and seepage beneath and around the dam contribute to flows in this reach of the creek but in a much smaller proportion compared to reservoir releases. As described in Section 4.6 of the EIR (see Tables 4.6.16 and 4.6.17, and Figures 4.6.11a, 4.6.11b, and 4.6.12), the proposed project would not substantially alter streamflows in Calaveras Creek downstream of the dam such that they would be outside the range of pre-project conditions and result in substantial hydrologic changes. Under the proposed project, streamflows in Calaveras Creek would be regulated in substantially the same manner as under existing conditions. Flows would be highest in the winter months of wetter years and lowest in the summer months of all years and the winter months of drier years. Peak flows would be the same or greater than under the existing condition, and minimum base flows would be increased in all years due to implementation of the steelhead flow release schedules. In order to meet MOU temperature requirements during the summer, releases would have to be made from Calaveras Reservoir. Note that the proposed flow schedules include a constant release from Calaveras Reservoir of 2 cfs, which is 4 times larger than the current leakage below the dam. This flow would be maintained continuously, even when the flow targets have been met below the dam using bypass flows from ACDD. This increase in base flow conditions would provide a general improvement in conditions in Calaveras Creek below the dam.

A) Migration

Construction of the proposed replacement dam immediately downstream of the existing Calaveras Dam would continue the presence and effects of the existing dam, which is a long-standing barrier to fish migration. Therefore, implementation of the proposed CDRP would not change the baseline conditions relative to steelhead migration at the Calaveras Dam.

B) Spawning

This reach is not likely suitable for spawning because substrate consists of materials that are unsuitable (e.g., bedrock and boulders). Based on physical habitat conditions, steelhead would not likely utilize this reach for spawning; therefore, the CDRP would have no effect on spawning in this reach.

C) Rearing

As discussed above in Chapter 4, rearing habitat conditions in this reach are currently limited, in part, due to physical habitat conditions. The increase in summer base flows to this reach (from approximately 0.5 cfs to 2 cfs)

would improve any potential rearing habitat in this reach by providing an incremental increase in habitat volume and decreased water temperatures, which could also result in increased DO concentrations. Thus, the CDRP operations may increase the suitability of habitat in this reach for juvenile steelhead rearing; however, conditions would remain limited due to other factors that would not be changed with the proposed project (e.g., physical habitat limitations).

4.2.2.2 EXTENDED STUDY AREA

Niles Canyon and Lower Alameda Creek

Flow in Alameda Creek downstream of the confluence of Arroyo de la Laguna would be altered as a result of implementation of the proposed project in winter months of normal or wetter years; however, the change in flows would be substantially dampened by inflows from Arroyo de la Laguna and would not result in flows outside the range historically experienced in lower Alameda Creek.

Figure 4.6.16, Comparison of Average Monthly Flow at the Niles Gage, Recorded Flow versus Flow with Proposed Project, in the EIR presents the predicted changes in flow in Alameda Creek at the Niles gage over the 8-year period (2000–2007) with implementation of the proposed project. The solid blue area in Figure 4.6.16 represents average monthly flow at Niles, and the black line indicates calculated flow with implementation of the project. The discrepancy between the two lines represents a change between gage records and calculated flow under the proposed project. The analysis shows that based on the hydrology from 2000 to 2007, reductions in flow in Alameda Creek at Niles Canyon would occasionally occur under implementation of the project.

Reductions would occur in December through March of normal and wetter years, while flows in April and May of those year types would generally increase, with the exception of a slight decrease in April of wet years and May of above-normal years. Below-normal years would experience a slight decrease in February and slight to moderate increases in March and April. The remainder of months in all year types, including all months of dry years, are not expected to experience a change in flow from existing conditions with implementation of the project.

As explained in Section 4.6, implementation of the project alone without the Upper Alameda Creek Filter Gallery Project (UACFGP) could not be quantitatively analyzed because no model exists for this scenario. However, the SFPUC has committed to implementing MOU releases from the ACDD and Calaveras Reservoir upon completion of the CDRP regardless of whether the UACFGP has been implemented. Under the scenario where MOU flows are not recaptured by the UACFGP, the additional flows would continue down Alameda Creek into the reach downstream of Arroyo de la Laguna, resulting in less wintertime reduction of flow in normal and wetter years and slight increases in flow at other times of all years in lower Alameda Creek.

The calculated flows for lower Alameda Creek with implementation of the project (both with and without the UACFGP) are within the range of current flows in this segment of the creek. Further, the flood control infrastructure and water supply facilities in lower Alameda Creek were constructed and operational well before the current DSOD restriction on Calaveras Reservoir required the SFPUC to reduce its diversions at the ACDD. Therefore, implementation of the project would not affect the operation of flood control infrastructure and water supply facilities in lower Alameda Creek.

Implementation of the proposed project and the UACFGP would represent an incremental decrease in flows in winter months of normal or wetter years in lower Alameda Creek; however, the anticipated decreases would not substantially alter the hydrology outside the range of flows experienced in this portion of the creek. Implementation of the proposed project without the UACFGP, while not quantified, would result in less wintertime flow reductions and slight increases during most other months in lower Alameda Creek than predicted by the modeling presented in this impact discussion. Therefore, hydrology would be altered to a lesser degree with implementation of just the project without a recapture facility.

Migration

The stream flow modeling described above determined that flows in Alameda Creek in Niles Canyon and downstream, on average, would occasionally be reduced under the CDRP relative to existing conditions. As discussed above, it should be noted that the changes (i.e., decreases in flow) would be considered conservative for above-normal years as the analysis conservatively assumes only the minimum flows consistent with flow

schedule C. The magnitude of change would be decreased with the implementation of flow schedules A and B during normal and wet years (per calculation of cumulative monthly stream flows at the Arroyo Hondo gage).

The CDRP's predicted effect on flows would occur only during periods when flow conditions are conservatively predicted to remain relatively high and sufficient for steelhead migration. As discussed above, peak flows originating from upstream and accretion of flow from local tributaries would contribute to periodic pulse flows. Therefore, operation of the CDRP is expected to have negligible effects in the extended study area on future steelhead migration.

Spawning

Steelhead spawning habitat in lower Alameda Creek is either absent or very limited, and there are no proposed spawning habitat restoration projects in this reach of Alameda Creek. Further, there is no spawning habitat in the segment of lower Alameda Creek below the BART weir.

Potential spawning habitat is present in Niles Canyon; however, future production of individuals spawned in this reach would be restricted by several factors related to subsequent rearing requirements and existing and future habitat limitations (see discussion below). As described above under the sub-heading "Migration," stream flow modeling indicated that the CDRP could result in relatively small reductions in average monthly flow in winter months of above-normal/wet years as compared to existing conditions. Relative to existing conditions, the maximum flow reduction would occur during January of an above-normal year; however, the average flow during this period would be anticipated to remain relatively high. No changes in flow would be anticipated to occur in below-normal and dry years when naturally low flow conditions would potentially result in the most limited habitat conditions for spawning. As discussed above, it should be noted that the changes (i.e., decreases in flow) would be considered conservative for above-normal years as the analysis conservatively assumes only the minimum flows consistent with the 1997 MOU (schedule C). The magnitude of change would be decreased with the implementation of flow schedules A and B during normal and wet years (per calculation of cumulative monthly stream flows at the Arroyo Hondo gage).

Because the CDRP's predicted effect on potential steelhead spawning habitat would occur only during above-normal year types when remaining flow conditions are conservatively predicted to still be relatively high, operation of the CDRP under the future cumulative scenario is expected to have negligible effects on future steelhead spawning.

Rearing

There are several key uncertainties regarding the availability and quality of rearing habitat in lower Alameda Creek and Niles Canyon (McBain and Trush 2008). The Niles Canyon reach historically may have provided important rearing habitat for juvenile steelhead. Currently, rearing habitat in this reach for steelhead is limited by altered flows and warm water temperatures (ETJV 2008; McBain and Trush 2008, p. 10; Hanson Environmental 2002). As noted previously, the proposed installation of a cutoff wall adjacent to the gravel quarries in the Sunol Valley would be expected to increase contributions to stream flow and underflow of shallow groundwater into Niles Canyon.

As described In Section 4.6 of the EIR and above under the sub-heading "Migration," stream flow modeling indicated that the CDRP could result in reductions in average monthly flow in winter months of above-normal/wet years relative to existing conditions. Relative to existing conditions, the maximum flow reduction would occur during January of an above-normal year; however, the average flows during this period would be anticipated to remain relatively high. No changes in flow would occur in below-normal and dry years when naturally low flow conditions would potentially result in the most limited habitat conditions for rearing. As discussed above, it should be noted that the changes (i.e., decreases in flow) would be considered conservative for above normal years as the analysis conservatively assumes only the minimum flows consistent with the 1997 MOU (schedule C). The magnitude of change would be decreased with the implementation of flow schedules A and B during normal and wet years (per calculation of cumulative monthly stream flows at the Arroyo Hondo gage).

Habitat functions for rearing have been greatly diminished in lower Alameda Creek and the proposed project's predicted reduction in flows would occur during above-normal year types when remaining flow conditions are

conservatively predicted to still be relatively high. Thus, operation of the CDRP is expected to have negligible effect on rearing habitat conditions for potential future occurring steelhead.

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ATTACHMENT A

Steelhead/Rainbow Trout Life History

LIFE HISTORY

O. mykiss have a dynamic life history. All O. mykiss hatch in the gravel substrate of cold-water streams. After hatching, the young fry emerge from the gravel and start feeding in the stream. Some begin to disperse downstream in the months following their emergence, but most continue to rear in the stream. Following a rearing period of at least one year, juveniles follow a variety of life history patterns, including residents (nonmigratory) at one extreme and individuals that migrate to the open ocean (anadromous) at another extreme. Intermediate life history patterns include fish that migrate within the stream (potamodromous), fish that migrate only as far as estuarine habitat, and fish that migrate to near-shore ocean areas.

Juveniles that become migratory typically do so after one or two years of rearing, but sometimes longer. Physiological changes in these fish (called smolts) ultimately allow them to make a transition from freshwater to seawater. Smolts migrate to the ocean, spend a variable amount of time there (typically one to two years), grow rapidly, and return to spawn, generally in the stream where they hatched. Steelhead are unusual among the other Pacific salmonids in that they do not all die after spawning. Some return immediately to the ocean, and others return after holding for a period in freshwater. Within a given stream, some O. mykiss do not migrate to the sea, and the proportion may vary considerably depending on local circumstances. These fish reach sexual maturity and spawn without entering the ocean and are often known as resident or stream rainbow trout (Gunther et al. 2000).

Anadromous steelhead exhibit two basic life history forms. Stream-maturing steelhead enter spawning streams before they are sexually mature, generally during the period between spring and early fall, and spend several months in the stream before they are ready to spawn. Ocean-maturing steelhead enter spawning streams during the fall and winter in a fully mature state and spawn relatively soon after entering freshwater (Gunther et al. 2000). Both forms may occur in the same river system with little or no genetic distinction. Details on the life history of steelhead inhabiting the Alameda Creek watershed are unknown; however, the low summer flows and seasonally elevated water temperatures within many of the reaches may have limited opportunities for stream-maturing adult steelhead to have successfully oversummered in many areas. Steelhead habitat requirements are associated with distinct life history stages, including migration from the ocean to inland reproductive and rearing habitats, spawning and egg incubation, rearing, and seaward migration of smolts and spawned adults. Habitat requirements and life history timing can vary widely over the steelhead's natural range (Barnhart 1986; Pearcy 1992; and Busby et al. 1996; cited in Gunther et al. 2000).

Spawning

The presence of self-sustaining resident rainbow trout populations with multiple-age class structure within the watershed provides evidence of consistent successful reproduction (Gunther et al. 2000). The best potential spawning (and rearing) habitat in the watershed exists in the upper reaches of Alameda Creek, upstream tributaries, and the Arroyo Mocho canyon.

Steelhead/rainbow trout, like all Pacific salmon, select spawning sites with specific features. These features include gravel substrate with sufficient flow velocity to maintain circulation through the gravel and provide a clean, well-oxygenated environment for incubating eggs. Preferred gravel substrate is in the range of 0.25 to 2.5 inches in diameter, and flow velocity is in the range of 1 to 3 feet per second. Steelhead will use substrate with larger gravel (up to 4 inches) than will resident trout. Sites with preferred features for spawning occur most frequently in the pool tail/riffle head areas, where flow accelerates out of the pool into the higher gradient section below. In such an area, the female steelhead will create a pit, or redd, by undulating her tail and body against the substrate. This process also disturbs fine sediment in the substrate and lifts it into the current to be carried downstream, cleaning the nest area. Survival of fertilized eggs through hatching and emergence from the gravel is most often limited by radical changes in flow that can dislodge eggs from the substrate, result in sedimentation, or dewater incubation sites (Gunther et al. 2000).

Areas of the watershed that support resident trout all show evidence of successful spawning, as indicated by the presence, abundant in places, of young-of-year trout. Suitable substrate conditions for spawning and egg incubation are found at some level in all stream reaches potentially supporting steelhead. Given the high potential fecundity of steelhead, factors other than availability of spawning habitat are likely to be more limiting; however,

reconnaissance surveys conducted to date are not of sufficient detail to quantify the overall extent and quality of suitable substrate (Gunther et al. 2000). It is possible that more detailed observations would reveal opportunities for improving spawning habitat and enhancing production of steelhead juveniles. However, the availability of spawning habitat does not appear to preclude steelhead from completing their life cycle in the Alameda Creek watershed (Gunther et al. 2000).

Juvenile Rearing

Rearing habitat is limited in most of the areas potentially supporting steelhead by low summer stream flow and exposure to seasonally elevated water temperatures (Gunther et al. 2000). This natural condition under which steelhead in these reaches evolved has been exacerbated by urban development. However, areas exist with suitable water temperature for rearing *O. mykiss*, particularly in the upper canyon reaches of the creek and larger tributaries (Gunther et al. 2000; Hanson Environmental 2002). In some of the stream reaches supporting the greatest numbers of resident trout, low summer stream flow results in relatively small, infrequent, isolated pools (e.g., the reach of Alameda Creek located upstream and downstream of the diversion dam). More pools or larger pools would be expected to allow greater numbers of trout to survive the low-flow period (Gunther et al. 2000), but this is a natural condition in these reaches and one to which steelhead/rainbow trout have adapted. Availability of late-summer habitat may limit the abundance of steelhead/rainbow trout within the watershed, but it does not preclude them from completing their life cycle (Gunther et al. 2000).

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ATTACHMENT B



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Date: March 13, 2009

To: Harlan Kelly, Assistant General Manager, Infrastructure Division
Julie Labonte, Water System Improvement Program Director

From: Michael Carlin, Deputy General Manager

Re: Proposed Instream Flow Schedules to be included in the Calaveras Dam Replacement Project Biological Assessments

GAVIN NEWSOM
MAYOR

ANN MOLLER CAEN
PRESIDENT

F.X. CROWLEY
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JULIET ELLIS
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ED HARRINGTON
GENERAL MANAGER

The Water Enterprise proposes the following instream flow schedules for Calaveras Dam and operational rules for flow bypass at the Alameda Creek Diversion Dam (Figure 1) to support native species below these facilities, including resident rainbow trout, anadromous steelhead, and California red-legged and foothill yellow-legged frogs. These schedules will be considered in the Calaveras Dam Replacement Project (CDRP) Biological Assessments, the CDRP Draft Environmental Impact Report, and the Alameda Watershed Habitat Conservation Plan (HCP).

Instream Flow Objectives and Background

One objective of the proposed instream flow schedules is to contribute to suitable cold water spawning and rearing habitat for native rainbow trout and steelhead in reaches of Calaveras and Alameda creeks where flows are primarily regulated by SFPUC facilities¹. Another objective is to provide suitable conditions for other native fishes and amphibians, including Pacific lamprey and California red-legged and yellow-legged frogs, downstream of these facilities. While this proposal focuses on instream flows, other non-flow factors (e.g., riparian cover) that could also improve habitat conditions for these native species will need to be considered.

Unimpaired flows in the watershed are “flashy” (increasing and subsiding rapidly in response to rainfall events) during the rainy season, providing a wide range of flow conditions within any particular water year. These are the conditions under which native species, including steelhead, evolved within the watershed. While resident rainbow trout currently inhabit stream reaches both upstream and downstream of

¹ The SFPUC believes that stream management issues on Alameda Creek below the confluence with the Arroyo de la Laguna (Niles Canyon and the Flood Control Channel) are a shared responsibility among the SFPUC, Alameda County Water District, and the Zone 7 Water Agency. The SFPUC is committed to working with these parties and in coordination with the Alameda Creek Fisheries Restoration Workgroup to develop and implement stream management approaches for those stream reaches.

SFPUC facilities, adult steelhead migrating from the ocean to spawning areas in Alameda and Calaveras creeks (once passage has been provided at existing barriers downstream) will only be able to occupy habitat downstream of SFPUC facilities. Juvenile steelhead rearing habitat will also be limited to stream reaches below SFPUC facilities.

During the development of this proposal, consideration was given to the SFPUC Water Enterprise Environmental Stewardship Policy—particularly the concept of mimicking the variability of unimpaired flows downstream of SFPUC facilities. In general, the proposed schedule is consistent with this approach. The proposed instream flow recommendations include spawning flows in the winter and rearing flows during the spring, summer and fall that are of greater magnitude and more consistent than calculated unimpaired flows—particularly the rearing flows in Schedules A and B (described below). This approach provides predictable year-round flow conditions for resident rainbow trout and steelhead during all life-stages in those reaches primarily affected by SFPUC facilities, and helps to support more reliable production in the stream reaches that remain accessible to anadromous fish.

The proposed schedules have been developed using the best available information, and may be modified based on future work. Consideration was given to the operational implications of the schedules given the expected levels of performance of these facilities (e.g., ramping rates, meeting the average daily flows targets by using a running 5- or 7-day average, etc.).

In addition to the proposed flow schedules described below, the SFPUC is pursuing the Alameda Creek Fisheries Enhancement Project, which focuses on recapturing releases from Calaveras Dam via a subsurface collection system (under existing Calaveras Dam water rights), and pumping this water to San Antonio Reservoir. Water will only be recaptured when habitat downstream of the recapture facility is not expected to be dewatered in a manner that will jeopardize resident trout/steelhead migration during winter. In general, recapture opportunities exist during the winter releases for spawning and high rainfall events, and during the spring/summer releases for rearing (based on the assumption that the Sunol Valley reach downstream from the Sunol Valley Water Treatment Plant was not historically, and is not currently, suitable for rearing habitat).

As committed to in the WSIP Final PEIR, fish passage and/or screening alternatives at the Alameda Creek Diversion Dam will also continue to be investigated in the CDRP and the Alameda Watershed HCP. Issues to be addressed include feasibility of passage/screens, including costs and benefits, and communication/coordination with upstream private landowners.

Hydrologic Classification

In order to develop instream flow schedules that reflect watershed hydrologic conditions, a water-year classification was developed based upon monthly cumulative

flows over 26 years of record at the USGS gage on the Arroyo Hondo (USGS 11173200), an unregulated tributary upstream of Calaveras Reservoir. The Arroyo Hondo gage captures 62% of the watershed area contributing inflows to Calaveras Reservoir when the watershed area above the Alameda Creek Diversion Dam is also taken into account.

The USGS gage upstream of the Alameda Creek Diversion Dam (USGS 11172945) was also considered as a basis for the analysis, but it was determined that the Arroyo Hondo gage better reflected the full range of unimpaired flows in the watershed given the larger watershed size and longer period of record. The Arroyo Hondo gage is therefore used as an indicator of overall watershed hydrologic conditions in the remaining 38% of the watershed area that contributes inflows to Calaveras Reservoir.

Cumulative monthly stream flows at the Arroyo Hondo gage were ranked as exceedance probabilities (Figure 2), then divided into three classes to establish "wet" (0-20%), "normal" (20-60%), and "dry" (> 60%) water-year types (a water year begins October 1st and ends September 30th)². This approach is similar to the SFPUC release schedules for O'Shaughnessy Dam on the Tuolumne River.

Proposed Instream Flow Schedules and Flow Bypass

The objectives of the proposed schedules are to provide reliable resident trout and steelhead spawning and rearing habitat in Calaveras and Alameda creeks during any particular water-year type, and to provide sufficient and suitable habitat for other native fishes and amphibians. During wetter years, the schedules provide for downstream increases in the spatial extent of suitable cold water spawning and rearing habitat, as follows:

- *Schedule C ("dry")*: Schedule C provides suitable cold water spawning and rearing habitat in Calaveras Creek downstream of Calaveras Dam, and in Alameda Creek from its confluence with Calaveras Creek downstream through Sunol Regional Park.
- *Schedule B ("normal")*: Schedule B provides suitable cold water spawning and rearing habitat in Calaveras Creek downstream of Calaveras Dam and in Alameda Creek from the Calaveras Creek confluence downstream through Sunol Regional Park and downstream to the approximate location of the Sunol Valley Water Treatment Plant.
- *Schedule A ("wet")*: Schedule A provides additional suitable spawning and rearing habitat in Calaveras Creek downstream of Calaveras Dam and in

² This classification will provide for continuity within Water Enterprise water resources planning since the different indices used in PEIR and water operation models which have five categories can be rolled up into these three proposed schedules (wet = wet, normal and below normal = normal, and dry and critically dry = dry).

Alameda Creek downstream of Calaveras Creek while maintaining the extended cold water rearing habitat provided in Schedule B.

These schedules were developed based on two primary references:

1. Alameda Creek Water Resources Study, Bookman-Edmonston Engineering, Inc., January 1995.
2. Calaveras Dam Replacement Project Fisheries Technical Report, Hagar Environmental Sciences, 2008.

The rearing habitat recommendations were developed using the Bookman-Edmonston report and assume the temperature target for each downstream location (the downstream Sunol Regional Park/SFPUC property boundary and the Sunol Valley Water Treatment Plant) is approximately 68 F under a “worst-case” conditions (i.e., high ambient air temperatures). Because the flows necessary to achieve this objective during most months are likely to be lower than those proposed (7 and 15 cfs, respectively), these recommendations should be considered rearing flow maximums of 7 cfs (Schedule C) and 15 cfs (Schedules A and B).

Spawning flow recommendations were developed using the Hagar report, where maximum spawning habitat conditions for steelhead in the reaches below SFPUC facilities were estimated to be during flows of 42 cfs.

These assumptions will need to be confirmed in the CDRP and Alameda Watershed HCP analyses. Other non-flow factors (e.g., riparian cover) that could also improve habitat conditions for other native fish and amphibian species will need to be considered, and may affect instream flow recommendations.

Similar to the release schedules for O’Shaughnessy Dam, the use of monthly cumulative flow in the water-year type classification allows for changing from one water-year type to another on a monthly basis depending on cumulative monthly runoff totals, as determined each month from the Arroyo Hondo gage. This approach generally reflects watershed hydrologic conditions at any particular time during the water year.

The compliance point for the release schedules is the Alameda Creek USGS gage (USGS 11173510) downstream of the Calaveras Creek. Flows measured at this location include local accretion flows (contributed by drainages downstream of Calaveras Dam and the Alameda Creek Diversion Dam), Alameda Creek Diversion Dam bypassed flows, and releases from Calaveras Dam. Regardless of the time of year and flow schedules, however, a minimum of 2 cfs, as measured at the Calaveras Creek USGS gage (USGS 11173500) will be released from Calaveras Dam to sustain cold water refugia in Calaveras Creek downstream of Calaveras Dam.

The proposed instream flow schedules and the corresponding inflow criteria as measured at the Arroyo Hondo gage are described in Table 1. Hydrographs for the proposed schedules are provided in Figure 3.



In addition, the SFPUC Water Enterprise will implement WSIP FPEIR mitigation measure 5.4.5-3a, which provides a bypass of up to 10 cfs downstream of the Alameda Creek Diversion Dam from December 1 to April 30 when sufficient stream flow is generated by precipitation events.

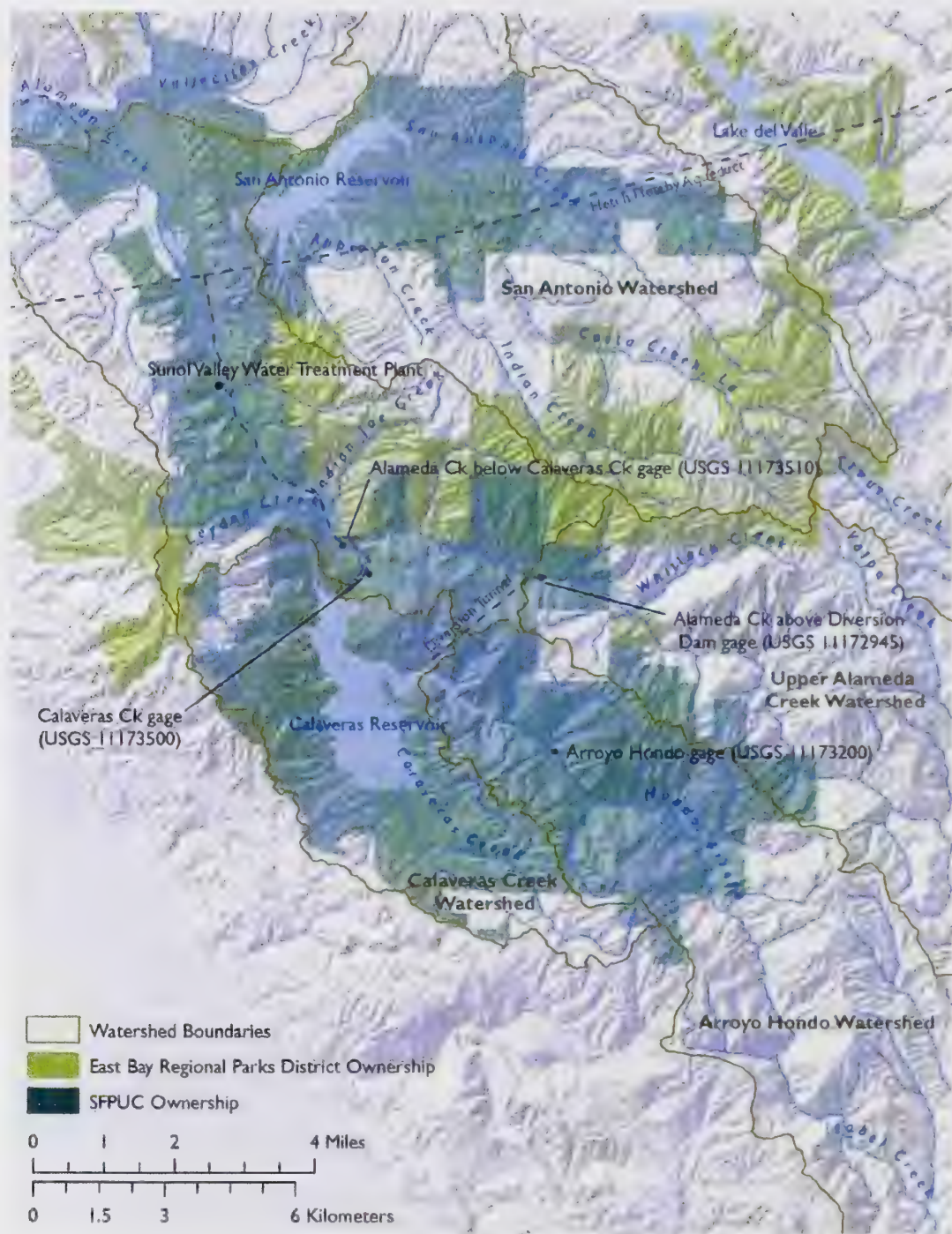


Figure 1. Map of the Calaveras Dam/Alameda Creek Diversion Dam area.

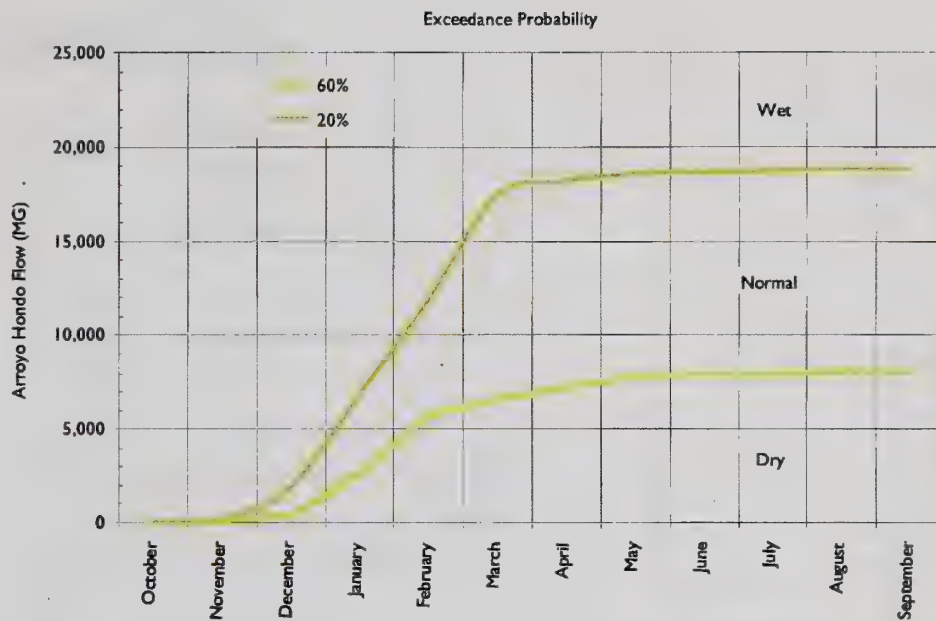


Figure 2. Exceedance probabilities used to develop the hydrologic classification.

Table 1. Summary of the proposed instream flow schedules.

Flow Schedule Decision Date	Flow Schedule Application period	Dry (Schedule C)		Normal (Schedule B)		Wet (Schedule A)	
		Cumulated flows for water year classification (MG)	Flow requirement (cfs)	Cumulated flows for water year classification (MG)	Flow requirement (cfs)	Cumulated flows for water year classification (MG)	Flow requirement (cfs)
N/A	October	N/A	7	N/A	7	N/A	7
N/A	Nov. – Jan. 11	N/A	5	N/A	5	N/A	5
Jan. 11	Jan. 12 – Jan. 31	< 1166	20*	1166 - 3660	20*	> 3660	42*
Jan. 31	Feb. 01 – Feb. 28	< 2597	20	2597 - 6882	20	> 6882	42
Feb. 28	Mar. 01 – Mar. 31	< 5721	20*	5721 - 11859	20*	> 11859	42*
March 31	Apr. 01 – Apr. 30	< 6563	7*	6563 - 17449	15*	> 17449	32 – 18*
April 30	May 01 – May 31	< 7246	7	7246 - 18211	15	> 18211	15
May 31	June 01 – June 30	< 7838	7	7838 - 18551	15	> 18551	15
June 30	July 01 – Sept. 30	< 7948	7	7948 - 18693	15	> 18693	15

* Need to follow daily schedule to maintain ramping (see Appendix 1).

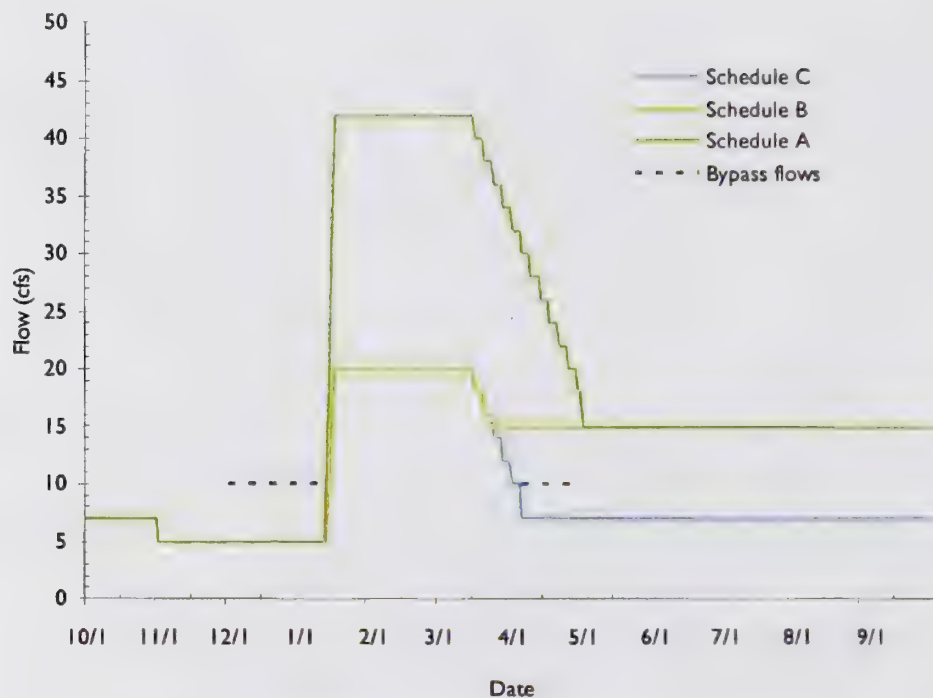


Figure 3. Hydrographs illustrating the minimum instream flow release schedules for Calaveras Dam and the Alameda Creek Diversion Dam bypass schedule.

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